Dr. Gerald R. Allen

RAINBOWFISHES

In Nature and in the Aquarium

Tetra

Melanotaenia splendida rubrostriata

Gerald R. Allen

RAINBOWFISHES

Their identification, care, and breeding

Tetra

PHOTOGRAPHS

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Above left: ***Melanotaenia boesemani*** **(left) and** ***Chilatherina bleheri*** **(right)**

Above right: ***Glosselepsis incisus*** **(above ♂, below ♀)**

Below left: ***Melanotaenia maccullochi*** **(left ♀, right ♂)**

Below right: ***Iriatherina werneri*** **(♂ ♂ from Papua - New Guinea)**

Photo insertion front: **Camp Creek, Western Australia, habitat of** ***Melanotaenia splendida australis***

Photo insertion rear: **Lake Sentani, Irian Jaya, habitat of** ***Glossolepis incisus***

Rear cover photograph: ***Pseudomugil furcatus*** **(above ♀, below ♂)**

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Melanotaenia trifasciata

Iriatherina werneri **(♂ ♂ from Papua New Guinea)**

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FOREWORD

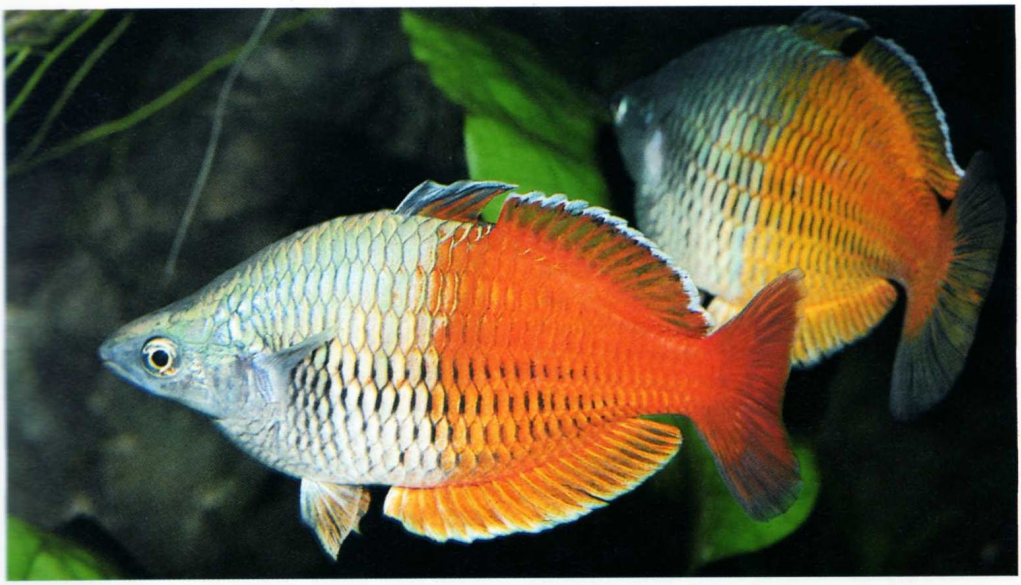
It is most gratifying to witness the phenomenal growth of the rainbowfish hobby. When I began research on this group there was scarcely any interest at all, apart from a few keen specialists. Indeed, only a few species were then available in aquarium shops. We've certainly come a long way since these humble beginnings. Rainbowfishes and their close relatives, the blueeyes, are now well known throughout the fish-keeping world. New species are being introduced at a rapid rate. Furthermore, there are excellent prospects of exciting new discoveries in the near future.

It's been exciting to be a part of this growth process. There were times, back in the early 70's, when I felt I was the only person really interested in rainbows. Scientifically speaking, this may well have been true! But I was certainly not alone when it came to appreciating their huge potential as an aquarium attraction. Rainbows have been kept as pets for decades. The first exported specimens, kept in a shipboard aquarium, survived the long journey from Brisbane to Germany in 1927. Only one pair *(Melanotaenia duboulayi)* survived, but they were successfully bred in the Berlin Aquarium. This marked the official beginning of the international rainbow hobby.

By the early 1970's approximately seven rainbow species had entered the German aquarium hobby. Most of the new additions originated from Irian Jaya. The most famous of these were the stunning Red Rainbow *(Glossolepis incisus)* and the delicate Threadfin Rainbow *(Iriatherina werneri)*. The hobby literally exploded over the next decade. Before the Australian government imposed an import ban on New Guinea rainbows, many new species were introduced. At first just a few fish were distributed among a few capable Melbourne breeders, particularly Ron BOWMAN and Neil ARMSTRONG. They nurtured the first captive stocks of many New Guinea species. Then, largely through the efforts of Ron BOWMAN, a method was devised of sending rainbow eggs in vials through the postage system. This technique revolutionised the hobby in Europe and North America.

Another important development was the establishment of Aquarium Rio, a wholesale aquarium fish business in Frankfurt, Germany, owned and operated by Heiko BLEHER. Heiko is truly one of the last of a rare breed of thrill-seeking collector-adventurers. His ultimate goal in life is to collect, breed, and introduce as many new and beautiful fishes to the hobby as possible. To

Glossolepis incisus



Melanotaenia boesemani

this end he has travelled throughout the tropics - up the Amazon, into darkest Africa, and through the jungles of Borneo. If there is rare fishes to be found, Heiko will bring them back alive.

Heiko and I met during a visit to Irian Jaya in 1982. He was the perfect field partner - the first person I've met who shared my absolutely insatiable appetite for daily, dawn-to-dusk fish collecting. For 10 days we collected from one end of Irain Jaya to the other, flying everywhere in a chartered single-engine aircraft. Our prize catch was the magnificent Boseman's Rainbow *(Melanotaenia boesemani).* In gratitude of Heiko's assistance I named one of the new rainbow species *Chilatherina bleheri.* Heiko successfully brought live specimens of these fish and others back to Germany. That was the beginning of his infatuation with New Guinea. Heiko has made several trips since then, and the hobby has been infinitely enriched by his success.

As we near the end of this century the rainbowfish hobby is thriving as never before. Australians may have started the "rainbow revolution", but these fishes are now popular the world over. There are currently about 50 species of rainbows and closely related blue-eyes in the international aquarium hobby. Still, there is much room for improvement. A further 20 species are yet to be introduced, including one that I predict will be among the most stunning - *Melanotaenia corona* from north-eastern Irian Jaya (currently known from a pair of preserved specimens collected in 1911).

I certainly hope you enjoy this book, which summarises our current knowledge of this intriguing group. I have combined my own personal knowledge of rainbowfishes and blue-eyes with information gathered from a variety of sources - mainly personal anecdotes from fellow aquarists and a wealth of articles published in the three main organs of the hobby: the Australian *Fishes of Sahul,* the American *Rainbowfish Times,* and the German *Regenbogenfisch.* Hopefully, the following pages will enrich your fish-keeping experience. I look forward to your comments and any information that I may have missed. Although our hobby has made huge strides in the past three decades, there is still more to learn. This is certainly not the last word on these intriguing fishes!

Gerald R. Allen Perth, Australia

ACKNOWLEDGEMENT

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Glossolepis incisus

and Andy WATTAM, for generously, donating their wisdom, not to mention much appreciated, occasional shipments of live fish. I thank Gary LANGE for organising visits to the USA in 1989 and 1995, on which I met many friendly, dedicated rainbow keepers. I am also thankful for the support that has been shown by the European IRG organisation, particularly Jürgen

Glossolepis maculosus

CLASEN, Eddy DERIJST, Gilbert MAEBE and Harro HIERONIMUS.

Bruno Condé, Editor of *Revue Francaise Aquariologie*, has taken great interest in my work for many years, and has published many of my rainbowfish articles in his excellent magazine. Similar interest has been expressed by Warren BURGESS, Ichthyological Editor of the American *Tropical Fish Hobbyist* magazine.

Scientific colleagues who have been particularly helpful with my rainbow studies include Barry HUTCHINS and Sue MORRISON (Western Australian Museum), Doug HOESE and John PAXTON (Australian Museum), Roly MCKAY (Queensland Museum), Helen LARSON and Barry RUSSELL (Northern Territory Museum), Martin GOMON (Museum of Victoria), Jim MENZIES (University of Papua New Guinea), Walter IVANTSOFF, Lucy CROWLEY and Basim SAEED (Macquarie University), Lynne PARENTI (Smithsonian Institution), Han NIJJSEN and Issac ISBRUCKER (University of Amsterdam), and Marinus BOSEMAN and Martin VAN OIJEN (Natural History Museum, Leiden).

Last, but not least I thank my family for their unwavering support of all my endeavours, as foolish as they may seem. My parents, Rex and Joan ALLEN, nurtured my childhood appreciation of the natural world. My wife, Connie, has been a shining light throughout our more than 30 years of marriage. More than anyone else, she deserves any plaudits that happen to come my way. I also thank my sons, Tony and Mark, for their interest and support of my diverse projects.

INTRODUCTION

Realm of the Rainbowfish

Rainbowfishes are one of the fastest growing branches of the aquarium hobby. What caused this big surge of interest? After all they have been known in the international hobby since 1927. The answer is simple - new, incredibly beautiful species are being introduced at a rapid rate. In fact, the past 10-15 years has seen a doubling of the number of documented species, mainly due to scientific exploration of previously unsampled regions, particularly in New Guinea. The good news is that even more exciting discoveries can be expected in the near future, especially from the wilderness of Irian Jaya, the little explored, western half of New Guinea.

The realm of the rainbow encompasses New Guinea as well as eastern and tropical sections of Australia. Much of this huge region, particularly New Guinea and the northernmost parts of Australia, are seldom visited by travellers. The "realm" includes some of the most exciting landscapes on earth - red sandstone gorges and contrasting azure-blue skies in the Kimberley region of Western Australia, tranquil lily lagoons and *Pandanus* swamps in the Northern Territory, flocks of screeching Rainbow lorikeets roosting among paperbark trees along a picturesque Cape York stream, fiery sunsets on the majestic Sepik River of New Guinea, the isolated wilderness at Lake Tebera, and the lush carpet of virgin rainforest that covers most of New Guinea's interior. These are just a few of the many memorable impressions of past visits to the "realm."

Rainbowfishes and blue-eyes are enormously abundant throughout this vast area. They are an integral part of the fish community in a variety of aquatic habitats - rivers, tributary streams of various sizes, drainage ditches, swampy lagoons or "billabongs", lakes, ponds, reservoirs, springs, and puddles in otherwise dry streambeds are all populated by these fishes. Some blue-eyes even penetrate marine habitats, particularly mangrove shores. One of the most fascinating aspects, particularly of rainbows, is the very localised occurrence of many species. They are often restricted to a single isolated lake or small section of a particular river system.

Habitat of *Melanotaenia splendida splendida*, Running River, North Queensland

My life with rainbows and blue-eyes

My own involvement with rainbows dates back to 1974. My scientific background up until then was exclusively devoted to coral reef fishes. I stumbled onto rainbowfishes almost by accident. I was invited to participate in a survey to the remote Kimberley region of Western Australia. This was an entirely new experience to an avowed marine biologist. What an experience! Sleeping under the stars, leisurely exploring spectacular gorges each day, swimming in pristine pools, and being ferried around by helicopter. And yes, I also found time to catch a few fishes. The variety was far less than what I was used to on coral reefs, but these totally unfamiliar species were fascinating nevertheless. I was particularly impressed by the shoals of rainbowfishes. Their silvery blue bodies, streaked with red, glistened in the bright sunlight. They were by far the most common fish. I was so impressed that I decided to bring home a few live specimens. I had been bitten by the rainbow bug! This was the beginning of a love affair that continues to this day.

Two species of rainbows were collected on this trip. To my utter amazement both species, and nearly every other type of fish caught on the 3-week expedition, proved very difficult to identify. The few existing reference books were totally inadequate and the precious few scientific papers dealing with the subject were either poorly written or sadly out of date. Clearly, there was a need for further work on Australian freshwater fishes. I'm still a marine biologist first and foremost, but have maintained a strong interest in freshwater fishes ever since this revelation. Although my freshwater studies have involved the entire fauna of the Australia-New Guinea region, rainbowfishes have always been my number one priority.

After a preliminary period of intensive research I deduced that one of the two Kimberley rainbows was a new species. It was an unusually small fish, even for a rainbow, and I named it *pygmaea*. This discovery provided a strong stimulus for further research. Over the next few years I collected rainbows over much of northern Australia, from the desert streams of Western Australia to lush rainforests on Cape York Peninsula. More new species resulted, in addition to valuable information on their biology and distribution. There was no turning back now. I was definitely hooked!

Perhaps the most exciting trip during the early years of rainbowfish work was a visit to the Jardine River, near the tip of Cape York Peninsula. In the 70's this was virgin territory for fish collecting. My good friend Roger STEENE and I made the perilous trip by 4-wheel drive. The further north we progressed the more difficulties we encountered. Creek crossings were treacherous and the so called road was sometimes non-existent. Thankfully we were able to winch ourselves out of trouble on several occasions. Finally, these labours were rewarded with some incredible fish collections. We collected several fishes that were previously known only from New Guinea, including the fabulous Threadfin Rainbow *(Iriatherina)*. This was my first taste of what New Guinea held in store. It was obvious the next step in my quest for rainbowfish knowledge would be to cross the Torres Strait, the narrow gap of sea that separates Australia and New Guinea.

Enthusiasm for work on the other side of Torres Strait received a huge boost in 1981 when I received a grant from the Papua New Guinea Biological Foundation. Previous fieldwork in Australia was exciting and very rewarding, but it paled in comparison to my adventures in New Guinea. This was rainbow collecting at its best - in virgin territory where no other collectors had tread before. Although seldom visited by ordinary travellers, the realm of the rainbowfish encompasses some of the most exciting landscapes on earth. Over the next three years I covered thousands of kilometres, mostly by single engine aircraft, 4-wheel drive vehicles, occasional helicopters, and on foot.

Each successive visit yielded new rainbow treasures. Some of the most memorable included the elegant Lake Wanam

Raibow-fishing at the habitat of *Cairnsichthys*, North Queensland

Rainbow *(Glossolepis wanamenis)*, the delicate Popondetta Rainbow *(Pseudomugil connieae)*, the dazzling Tebera Rainbow *(Melanotaenia herbertaxelrodi)*, and the strange tetra-like Kiunga Blue-eye *(Kiunga ballochi)*. Every trip rekindled my enthusiasm. It's hard to describe the euphoria and sense of adventure I feel every time I arrive for another field trip on this exciting island.

It's been 21 years since I observed the first rainbows in the wild. My enthusiasm is still as strong as ever. There is still much to be accomplished as far as basic collecting and field surveys are concerned. Aside from a flurry of collecting activity at the beginning of this century by Dutch naturalists, there has been very little ichthyological exploration on the western half of New Guinea, the Indonesian Province of Irian Jaya. Three preliminary visits confirmed just how little work has actually been done. In several random collections at various localities, virtually every fish that was captured turned out to be a previously unknown species. I fondly refer to Irian Jaya as the last great frontier of rainbowfish collecting. It's long been my dream to do a proper survey of the entire province. But finding adequate finances to fund such a survey, and then getting permission from the Indonesian government have proven difficult obstacles to overcome.

At long last I'm finally poised to make an all-out assault on Irian Jaya's elusive fish fauna. I recently received a grant from the American-based National Geographic Society that will enable my Indonesian coworker Samuel RENYAAN and I to conduct the necessary fish-collecting surveys over the next few years. We are now in the process of obtaining the necessary permits and hope to initiate the work before this book goes to press. This will be the beginning of an exciting new phase of rainbow-

Pseudomugil conniae

fish research, and one which hopefully will facilitate the entrance of many new fishes into the hobby.

Meet the hobbyists

When my first book on the subject, *Rainbowfishes of Australia and Papua New Guinea,* was published in 1982, there was only a small number of mainly Australian and German aquarists who were interested in these fishes. In fact, as the manuscript was being prepared I wondered if it was really worthwhile to write a book that dealt with such a specialised subject. Not only were there few rainbowfish keepers in those days, there was also a shortage of fishes in the hobby. Thankfully, the book was well timed. It not only sparked new interest in the group, but coincided with the introduction of several exciting fishes into the hobby - species such as Boseman's Rainbow and the Kutubu Rainbow, which were instant sensations. The 1980's witnessed a huge growth in the popularity of rainbows and blue-eyes. Consequently, several societies were formed to cater to hobbyists that specialised in these fishes and other native Australian and New Guinean species. The three largest organisations are found in Australia, Germany, and the USA. Each has a membership comprised of several hundred individuals and numbers are still growing. They each publish an excellent magazine that is filled with practical advice for maintaining and breeding rainbows and blue-eyes, and adventure stories about

Capture of *Melanotaenia splendida splendida*, Dirrin Creek, North Queensland

Melanotaenia trifasciata

collecting fishes in the wild. The publications also list sources and prices for different species that can be purchased as eggs. The German IRG Society caters to members in all European countries (regional groups are located in Austria, Belgium, Denmark, and The Netherlands) and is published in a bilingual German/English format. If you do not belong to one of these organisations I strongly urge you to join. Contact addresses for obtaining further information are provided below.

Australia New Guinea Fishes Association (ANGFA)
Magazine:
Fishes of Sahul (published four times each year)
Address for information:
ANGFA
P.O. Box 673
Ringwood, Victoria 3134 AUSTRALIA

Internationale Gesellschaft für Regenbogenfische (IRG)
Magazine:
Regenbogenfische (published four times each year)
Address for information:
Harro HIERONIMUS
Nachtigallenweg 52
D-42657 Solingen
GERMANY

The Rainbowfish Study Group, Inc. (RGS)
Magazine:
The Rainbow Times (published four time each year)
Address for information:
Shelly TAYLOR
11164 Dodson Branch Highway
Gainesboro, TN 38562 USA

Natural history of Rainbows and Blue-eyes

Nothing gladdens the heart of a rainbowfish devotee like the sight of a gorgeous male in full colour, especially species such as *M. boesmani, M. lacustris*, and *M. trifasciata*. I know it may be hard to

believe, but these fish are even more beautiful when seen in the natural habitat. With few exceptions, the natural waters that are home to rainbows and several blue-eyes, are clean and clear - perfect for a refreshing swim and close-up look at these lovely fishes. That's why a diving mask and snorkel are vital parts of my field kit. Some of the most memorable moments on field trips include underwater encounters with rainbows. For example, in 1991 I made a helicopter visit to Lake Tebera, home of the colourful Tebera Rainbow *(M. herbertaxelrodi)*. The pilot had a very difficult time landing due to the scarcity of flat, dry ground. He eventually found a site on sloping terrain near the shoreline. I could scarcely wait to get wet. I entered the water in a 3-m diameter "blue hole", an incredibly clear 4 m-deep pool that drained into the center of the lake via a narrow 300 m-long channel. Tebera Rainbows were remarkably abundant, both in the spring and channel. The swarming fish were totally fearless. Courting males were everywhere, flashing brilliant neon hues in the sunlit waters. Not only was I astounded by their coloration, but their size was equally impressive, with many fish in excess of 12 cm.

I've experienced similar moments, some of the best involving *Melanotaenia boesemani, M. lacustris, M. exquisita, M. pygmaea, C. bleheri*, and *G. wanamensis*. Without doubt one of the outstanding sights I've had the pleasure to witness were brilliant shoals of Red Rainbows (*Glossolepis incisus*), vividly contrasted against dense green vegetation in the sunlit shallows of Lake Sentani. This has to be seen to be believed.

These close-up encounters in nature have given me a much better understanding of the everyday habits of these fishes. Rainbows and blue-eyes are gregarious creatures, spending much of the their time in schools or loose aggregations. They congregate near the surface, often in full sunlight, foraging for food. Analysis of stomach contents reveal they feed on a variety of tiny insects that fall onto the surface, ants in particular are a favourite item. Aquatic insects and various larval forms are also consumed with lesser amounts of small micro-crustaceans and filamentous green algae.

Although the fishes swim in the open, shelter in the form of aquatic vegetation and submerged forest debris is never far away. Fry and young fish in particular are strongly reliant on cover, not only to escape normal predators, but also cannibalism by larger individuals of their own species. Young are often present in large numbers among submerged grasses and other shoreline vegetation. Predators of adult rainbows include large fishes such as grunters (family Terapontidae), cardinalfishes (genus *Glossamia*), Barramundi *(Lates calcarifer)*, and freshwater snappers *(Lutjanus)*. They are also preyed on by a variety waterfowl, especially during drought periods when water levels are greatly reduced. Last, but not least, humans occasionally hunt rainbows for food. Neat piles of freshly caught Red Rainbows are sold at the market next to Lake Sentani. I've only resorted to eating rainbows on one occasion - during a jungle trek in New Guinea when there was nothing else to eat. They were terrible - the flesh was full of bones and laced with a strong formic-acid flavour.

Habitat of *Melanotaenia trifasciata*, Wenlock River, Cape York Peninsula

Rainbows and Science

Scientific names

Although the fundamentals of biological nomenclature and classification are common knowledge to many, it is my experience that the average non-biologist frequently has little idea of the basis of scientific names or how fishes are classified. It therefore seems worthwhile to include a brief section on the rudiments of this subject.

Every described organism, whether it is a single-celled amoeba, crab, bird, fish, or mammal, has a scientific or Latin name. It is composed of two parts and is generally italicised. The first part is the genus or generic name and the second is the species or specific name. For example, the Pygmy Rainbowfish is *Melanotaenia pygmaea*. The genus name *Melanotaenia* pertains to a group of closely related species which share a number of common features related to general shape, scalation, type of teeth, fin-ray counts, etc. The species name *pygmaea* applies only to a single entity that is distinguished from its relatives by a unique set of characteristics, often including colour pattern. Related genera (plural of genus) are grouped together in a family, whose spelling always ends in **-idae**. Worldwide there are 445 families of marine and freshwater fishes. A group of similar families is placed in one of the 35 orders of fishes whose spelling always ends in **-iformes.** The highest rungs on the „ladder" of classification pertain to class and phylum. The Class Myxini contains the jawless hagfishes and lampreys (no species included in this book); Chondrichthyes contains sharks and rays; and the third class, Osteichthyes, contains the majority of fishes, including rainbows and blue-eyes. All fishes, as do other higher animals including amphibians, reptiles, birds and mammals, belong to the phylum Chordata. Therefore, in summary the classification of the Pygmy Rainbow can be represented as follows:

Melanotaenia pygmaea

Phylum - Chordata (all animals with notochord)

Class - Osteichthyes (all bony fishes)

Order - Athriniformes (rainbows, blue-eyes and 5 other related families)

Family - Melanotaeniidae (all rainbowfishes)

Genus - *Melanotaenia* (closely related rainbows)

Species - *pygmaea* (Pygmy Rainbow)

Characters that are most often used to separate species, and often genera, include external features such as the number of fin rays, size and number of scales, ratio of various body proportions, and colour pattern. For higher classification, at levels above genus, internal structure, particularly those pertaining to skeletal elements, are often indicative of relationships.

Many rainbows and blue-eyes previously unknown to science have been found in Australia and New Guinea over the past few decades. When a new fish is discovered it is given a scientific name by the researcher who formally publishes a detailed description in a recognised scientific journal. Scientific names are frequently descriptive. For example *pygmaea* is Latin for dwarf and is therefore appropriate for the relatively small Pygmy Rainbow. New fishes are sometimes named after the locality from where they are collected, for example *wanamenesis* (Lake Wanam) or *novaeguineae* (New Guinea). A third category of specific names is based on the names of people, often the person who first discovers the fish (respectable researchers never name fishes after themselves). Fishes named after a male end in **-i**, those after females in **-ae**.

Evolution of Rainbows and Blue-eyes

Unfortunately there is no accurate information about the evolutionary history of rainbows and blue-eyes. Fossils are unknown, although insufficient work has been conducted on the relatively recent fossil strata of Australia and New Guinea. It is therefore difficult to accurately reconstruct a "family tree" for rainbow and blue-eye evolution. No doubt, a more accurate picture will eventually emerge when the relatively new technique of DNA sequencing is applied to these fishes. Even though there is insufficient data at present, it is not difficult to imagine how rainbows and blue-eyes might have evolved.

Rainbows and blue-eyes belong to the order Athriniformes, a group containing seven families and approximately 275, mostly marine species. Although no rainbow fossils have been identified, marine silversides in the related family Atherinidae have a fossil record dating back to the Eocene Epoch, about 57 to 37 million years ago. Rainbows and blue-eyes appear to be an evolutionary offshoot of the silverside evolutionary line. Blue-eyes, in particular, have several characters that indicate a close relationship to the marine silversides. Interestingly, they also share the marine habitat with atherinids. At least four species are found in either brackish or marine conditions, and one of these (*Pseudomugil*

Pseudomugil signifer

signifer) is equally at home in freshwater and marine surroundings.

In all probability rainbows and blue-eyes evolved from an atherinid ancestor which was originally adapted to brackish estuarine habitats, perhaps making brief excursions into fresh water. Eventually its descendants evolved a purely freshwater life cycle, therefore setting the stage for the explosive speciation of rainbows in relatively recent times, perhaps within the past 200,000 years.

Although much of central Australia is desert, there is an abundance of water around the periphery of the continent. New Guinea, in vivid contrast, is one of the wettest regions on earth. Each area has less than 300 purely freshwater fishes, a very poor endowment compared with other regions on earth. For example there are about 1,400 in Africa, 2,000 in South America, and 600 in China. Even tiny Thailand boasts an impressive figure of over 400 species. The general lack of fishes in Australia and New Guinea, in spite of ample aquatic habitats, has no doubt favoured the rapid speciation of ancestral fishes that invaded from the sea.

A lack of competition for living space and food allowed the ancestors of blue-eyes and rainbows to spread widely throughout inland waters. They appear to have colonised a variety of habitats with minimal resistance. Quick speciation in rainbows is enhanced by a high level of random variation that is evident in different populations of a single species in shape, colour pattern, and the number of scales and fin rays. Colour pattern in particular is a very flexible feature. For example, there are at least 10 quite distinct colour varieties of *Melanotaenia splendida splendida* occurring on the Atherton Tablelands in northern Queensland. With this type of "built in" genetic variability it is easy for the various populations to evolve into distinct species once they become isolated. There are numerous isolating mechanisms that can fragment a former homogenous population. They can include geological forces such as folding, faulting, and volcanism, which disrupt drainage patterns. Rising and falling sea levels can similarly effect drainages. The sea has risen dramatically over the past 10,000 years, obliterating the former connection between Australia and New Guinea. It appears this isolating event was responsible for the evolution of *Melanotaenia goldiei* (New Guinea) and *M. trifasciata* (Australia) from a former widely distributed ancestral population.

Melanotaenia splendida splendida

Classification

Rainbows and blue-eyes belong to the Atheriniformes, one of the 35 Orders of fishes. This group includes small, rather elongate species, which occur worldwide in tropical and temperate marine and fresh waters. Many of the species are silvery in colour or have a silver stripe along the middle of the body. They are mostly schooling fishes that scatter adhesive eggs that cling either to plants or the bottom. Typical diagnostic features include two separate dorsal fins, a single weak spine at the beginning of the anal fin, pelvic fins that are located on the abdomen, cycloid (smooth-margined) scales, and the absence of a lateral line. The relationship of this Order has been the subject of considerable controversy, but the current consensus is that it is related to the Cyprinodontiformes (killifishes and their allies). Here is a summary of the classification.

Order Atheriniformes

Family: Atherinidae -
Silversides (165 species);
worldwide, marine and freshwater.

Family: Pseudomugilidae -
Blue-eyes (15 species);
Australia & New Guinea,
estuarine and freshwater.

Family: Melanotaeniidae -
Rainbowfishes (53 species);
Australia & New Guinea, freshwater.

Family: Dentatherinidae -
Pygmy Silversides (1 species);
marine, tropical western Pacific.

Family: Telmatherinidae -
Sulawesi Rainbows (17 species);
freshwater (except one brackish water species), Sulawesi (except one species from Misool and Batanta Islands, Irian Jaya).

Family: Phallostethidae -
Priapiumfishes (20 species);
fresh and brackish waters,
Southeast Asia

Family: Notocheiridae -
Surf Silversides (6 species);
marine, tropical and temperate seas.

Melanotaenia herbertaxelrodi

Rainbowfishes and Blue-eyes in the Aquarium

Introduction

Rainbows and their blue-eye cousins are ideal aquarium fishes. They exhibit a wide range of bright colours, are variably sized with a handsome shape, have a peaceful disposition, and are easily bred. What more could you ask of an aquarium fish? It's surprising it has taken so long for them to rise to prominence in the hobby. The main reason is that for many years there were very few available species. But thankfully there have been some changes in recent years!

There are many different, equally successful approaches to keeping and breeding these fishes. Much of the fun and interest generated within the rainbow hobby comes from simple trial and error experimentation. We've come along way, but there is still much to learn. One of the really strong assets of rainbows is their durability, which allows us to try different techniques without the threat of losing stock. So don't be afraid to experiment!

Many readers will already be accomplished rainbow and blue-eye fanciers. But for beginners or perhaps those of you who have kept these fish, but never attempted to breed them, at least some of the sections below will be of interest.

Purchasing fishes

A wide assortment of rainbows and a few blue-eyes are now available in most large aquarium shops. It almost goes without

Rhadinocentrus ornatus

saying - if you are purchasing fish from a shop, make sure they are healthy and in good condition. How can you tell? It's easy - just take a bit of extra time and carefully watch for signs of illness or distress. Do not buy any fish, even if your selection appears perfectly healthy, from a tank that has occupants showing symptoms of disease such as whitespot, finrot, etc. At any rate, a reputable dealer would not sell fishes in this condition.

Fishes which have a hollow-bellied, emaciated appearance should also be avoided, even if they otherwise look healthy. Fishes in good condition, even the delicate blue-eyes, should have a robust appearance. The lack of good coloration should not be a deterrent, as the normal bright colours are often muted in the barren confines of a dealer's tank. A simple test to make sure the fish are displaying normal feeding behaviour is to wiggle your fingers close to the glass near the surface. Well conditioned fishes will respond by flocking towards your hand, in expectation of food.

Most rainbows and blue-eyes are good travellers and no extra precautions need be taken while transporting the fishes to your home. It's not really necessary to inflate the plastic transport bags with oxygen, air will suffice. I have successfully used the air technique for transit times of up to about 10 hours.

The tank should be set up with aged water, well in advance. If the fish are intended for an established community tank, it is advisable to house them in a separate quarantine tank for 1-2 weeks. This will insure that the new fish are disease free and that they are feeding properly. Always acclimatise new arrivals very gradually. Float the plastic bag in the tank until temperatures are equalised, then slowly dilute the contents of the bag with the tank water. An acclimatisation period of 1-2 hours is sufficient. This will avoid shock due to sudden changes of temperature and water chemistry (most notably pH).

Chilatherina bleneri **(left) and** ***Melanotaenia boesemani*** **(right)**

Aquarium size

There is considerable flexibility as far as proper tank size is concerned. Rainbows and blue-eyes are very adaptable, but it is best to avoid overcrowding. As a very general guide the following tank sizes are recommended for groups of 10-15 adult fish:

40 litres - All blue-eyes and very small rainbows such as *M. pygmaea*, *M. maccullochi* and *M. praecox*).

80 litres - medium-sized rainbows such as *M. boesemani*, *M. duboulayi*, and most subspecies of *M. splendida.*

150 litres - large-sized rainbows such as *Chilatherina bleheri, Glossolepis multisquamatus* and *Glossolepis incisus.*

The largest tank in my fish room is currently 325 litres. It comfortably accommodates 25 adult rainbows with an average size of about 8 cm.

Tank position

The optimum position is one which receives about 1-2 hours of early morning sunlight. This will enhance the coloration of the fish and promotes spawning condition. However, this position is not always realistic and direct sunshine is certainly not vital. Once they are acclimatised, most rainbows are not sensitive to disturbances outside the tank, such as people walking by. However, *Pseudomugil*, *Iriatherina*, and *Rhadinocentrus* are sometimes shy and easily upset. With this in mind, it is best to place their tank, in the least-disturbed part of the fish room, or in a quiet section of the house.

Melanotaenia goldiei

Lighting

There is a wide array of aquarium lights available. I mainly use Gro-Lux tubes, which seem to accentuate the subtle hues and brilliant reds displayed by many rainbows. One drawback with this type of lighting is that it is not particularly conducive to good plant growth. Tri-phosphor tubes, on the other hand, are great for plant growth, but do not show the fish colours to best advantage. One solution is to use a bank of mixed tubes, either one of each or a combination of two tri-phosphors and one Gro-Lux. Another, but very expensive alternative is to use a quartz-halogen system, which is the next best thing to natural sunlight. Optimal colours of rainbowfishes are evident when the lighting is placed at the front of the tank, thus striking the body surface at an acute angle. It is not necessary to keep the lights on all day long as long if there is ambient daylight. In winter I usually leave the lights on for about 10 hours daily. In summer, when there is ample ambient light in my shed, the lights are sometimes turned off for several days in a row. At this time they are used mainly to view the fishes, and just enough to promote plant growth.

Water chemistry

Rainbows and blue-eyes inhabit natural waters that display very characteristic properties of hardness and pH. Some species such as *Iriatherina werneri* and *M. nigrans*, are invariably found in soft, acidic conditions, whereas others, for example *M. lacustris* and *M. boesemani* are associated with alkaline waters. Fortunately, rainbows and to a lesser extent, blue-eyes, are very adaptable with regards to water chemistry. Most species will survive comfortably at hardness and pH ranges of 0-100 ppm and 6.5-7.5. Hardness does not seem to be a very critical factor. The normal values for tapwater at most locations is acceptable. I have never bothered to measure the hardness of our tapwater and have never encountered any problems with keeping or breeding rainbows. As far as pH is considered, a good rule of thumb is to keep the reading close to neutral (7.0) when in doubt. It is always advisable to maintain your fish within a pH range that approximates the natural conditions. Therefore, the natural values are included whenever available, in the accounts of individual species. Acidic conditions can be created by using a layer of peat below the gravel and furnishing the tank with abundant plant growth. Java moss is particularly good for this purpose.

Glossolepis wanamensis

More alkaline conditions can be achieved by slowly adding a dissolved solution of sodium bicarbonate.

Water changes

Rainbows and blue-eyes thrive on regular water changes. Not only is it an effective method of disease prevention, it also provides an excellent stimulus for spawning. In nature, regular water changes occur by means of normal stream flow or in the form of frequent rain showers. A study of *Melanotaenia splendida splendida* showed that spawning activity peaked at the onset of flooding. The amount and frequency of water changes is debatable. There are no hard and fast rules; everyone has their favourite method. Most agree that about 20-30 percent of the water should be changed, but the frequency is another matter. Some hobbyists prefer weekly changes,

which is probably not a bad idea if breeding is intended. However, I am not that diligent, and tend to be lazy in this department. My regime mainly consists of changes every 4-6 weeks, particularly in the case of tanks with a capacity in excess of 300 litres.

Plants

Optimum coloration of captive rainbows can only be achieved in a well-planted aquarium. Virtually all standard plants are acceptable. Some of my favourites for rainbow and blue-eye tanks are eel grass *(Vallisneria),* sword plants *(Echinodorus),* water sprite *(Ceratopteris),* and Java moss *(Fontinalis).* The last-mentioned plant is particularly recommended as it provides an excellent spawning medium. Other suitable spawning plants include *Ceratophyllum, Myriophyllum* and *Cabomba.*

Feeding

One or two feedings daily are sufficient, but do not over feed. It's best to spread the feeding over a 5-10 minute period, periodically adding a small amount of food. These fish are basically surface feeders so if too much food is given at once, much of it will sink to the bottom and be ignored. Small *Corydoras* cats are a good investment as they will scavenge uneaten bits of food on the bottom, and are peaceful tank mates.

Rainbows and blue-eyes are not fussy eaters. They will accept a wide variety of foods. Good quality dry foods with a high vegetable content are the main staple of the diet, but it needs to be supplemented with frozen, live, and vegetable foods. There are several good frozen foods available from most pet dealers, including brine shrimp, daphnia, and beef heart. They will also accept finely chopped or minced lean beef, fish, and chicken.

Live foods are eaten with great enthusiasm and its easy to understand why. This is the mainstay of the diet of wild rainbows. An analysis of stomach contents of fishes captured in the natural habitat reveals that most species primarily eat aquatic and terrestrial insects (especially ants), including their larvae. They also feed on tiny crustaceans. To promote optimum coloration and to bring your fish into spawning condition there is no substitute for live foods. They do not have to be given daily, especially if in short supply, but 2-3 times weekly is recommended. Mosquito larvae,

Chilatherina bleheri

Daphnia, and chopped earth worms are particularly good.

My favourite live food is mosquito larvae. I culture them in plastic tubs of aged water with rotting leaves and a few aquatic plants. During the summer, a single 38-litre tub maintains a steady supply of larvae of various sizes.

Brine shrimp is another good food. Live shrimp can often be purchased at your local aquarium shop. They can also be raised from eggs in plastic tubs, preferably placed outdoors where there is a few hours exposure to sunlight each day. Culture tubs should be filled with sea water or an artificial sea water mix. A quantity of shell grit or piece of old cement should be added as a buffer to keep the pH in the alkaline range. Keep the tubs covered with plastic during rainy periods and add freshwater as needed to compensate for evaporation. Brine shrimp can be fed with powdered yeast, but do not overfeed. Small amounts of yeast should be sprinkled on the surface each day. The shrimp will also eat the algae, which forms on the sides of the tank if exposed to sunlight. Harvest the adult shrimp with a large enough mesh size that will allow the smaller shrimp to pass through.

Glossolepis incisus
(female above, male below)

Sex determination

It is relatively easy to sex most rainbows. Males generally have brighter colours and longer dorsal and anal fins (which are pointed posteriorly as opposed to rounded in females). A few species such as *Melanotaenia trifasciata* and *M. boesemani* may be difficult to sex, particularly when first matur-

Cairnsichthys rhombosomoides

ing. However, the length of the first dorsal fin is usually a reliable indicator. The first dorsal of males is longer and generally overlaps the beginning of the second dorsal fin when it is laid back. In females this fin is much shorter and fails to reach the beginning of the second dorsal. Most blue-eyes are readily sexed on the basis of coloration; males are brighter and often have more ornate patterns on the dorsal and anal fins. Males also frequently possess a blackish, white, or yellow band on the uppermost portion of the pectoral fins. Moreover, the first dorsal fin of many species is long and filamentous. (INSERT DRAWING HERE)

Geographic varieties

Many rainbows, particularly species that have a wide geographic distribution exhibit a variety of colour variations that are associated with particular geographic localities. In some cases variations within a single species are so great that it is difficult to accept the fact that only one species is involved. Often there is a need for further laboratory study, particularly utilising genetic analysis, to assess the status of these varieties. Some of the Australian rainbows, such as *Melanotaenia trifasciata* and *M. splendida* are particularly renowned for this phenomenon. **As collectors and aquarists it is extremely important to label these varieties with their geographic "code" names.** Instead of simply using the name *M. trifasciata* in personal records, breeding logs, or any transactions involving the sale or exchange of fishes or eggs it is necessary to specify the geographic code with the species name. Therefore, do not identify your fish as merely *M. trifasciata,* but rather as *M. trifasciata* - Goyder River, *M. trifasciata* - Giddy River, *M. trifasciata* - Pascoe River, etc.

***Iriatherina werneri* from Papua New Guinea**

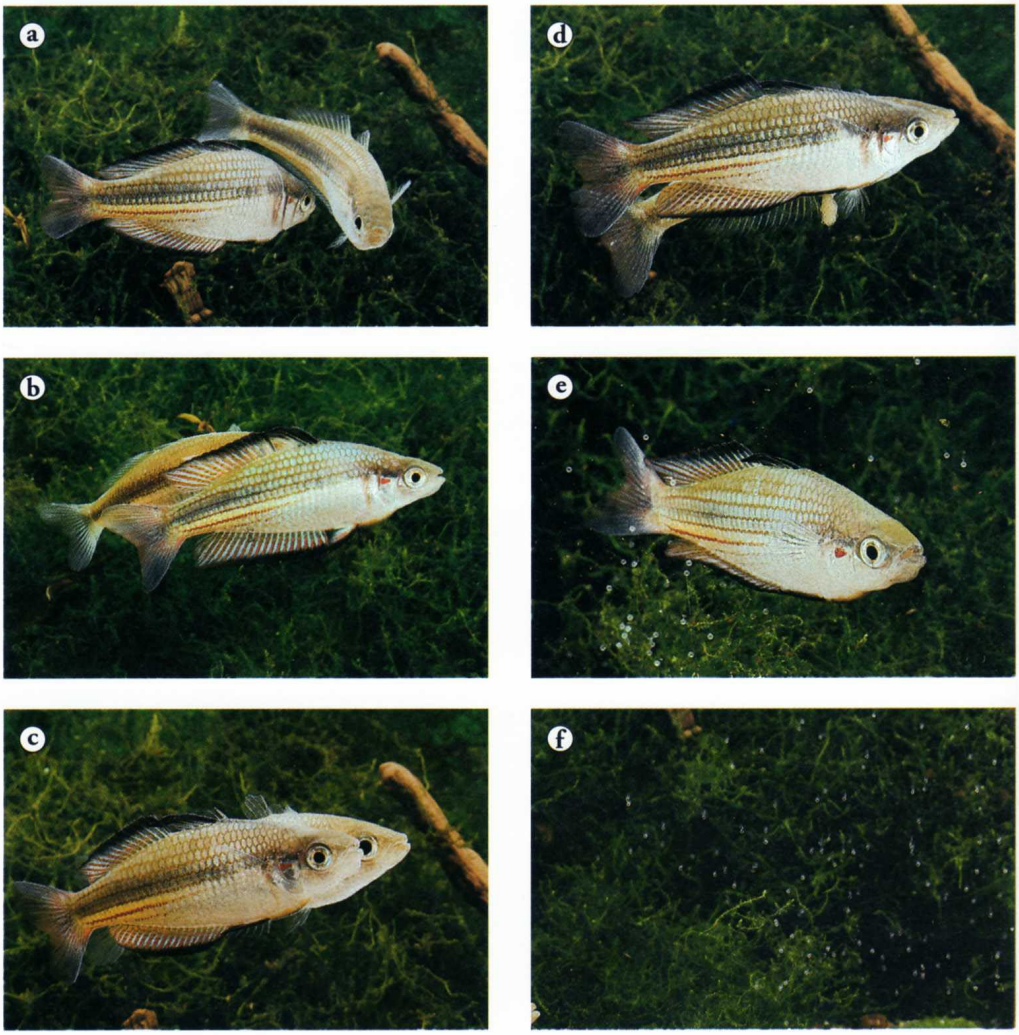
***Iriatherina werneri* from Australia**

***Melanotaenia maccullochi* from Papua New Guinea**

***Melanotaenia maccullochi* from Queensland**

Spawning behaviour of Rainbows

Spawning occurs predominantly in the early morning hours. A dazzling courtship display is exhibited by the male prior to spawning. He swims rapidly back and forth in the vicinity of the chosen nest site with the dorsal and anal fins fully erected. An intense dark margin is often apparent along the margins of these fins. Males of most species also display a bright neon-like stripe on the forehead. The displays continue for several minutes before the male succeeds in luring a partner to the selected site. Sometimes the actual spawning is preceded by the male nudging the female on the side near the pelvic base; this behaviour may be repeated intermittently for about five minutes. When spawning finally occurs, the partners come together side-by-side and face in the same direction. The release of eggs is accompanied by vigorous trembling of both fish.



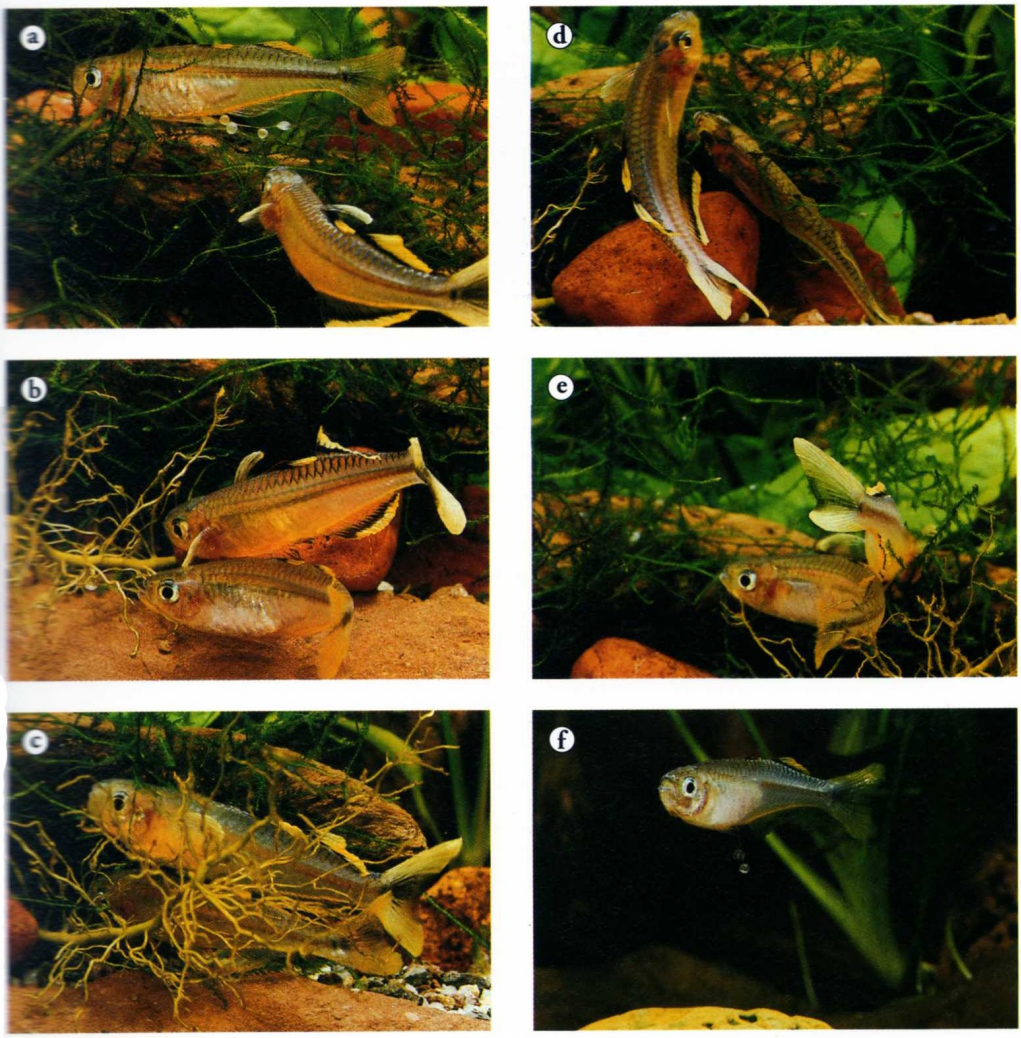
Spawning behaviour of *Melanotaenia duboulayi* (a-f)

Spawning behavior of Blue-eyes

The male swims rapidly back and forth in front of the female, vigorously fluttering the pectoral fin and repeatedly erecting the dorsal, anal, and pelvic fins. Eventually the fish dart into the vegetation (or spawning mop) and vigorously tremble side-by-side, while facing in the same direction. The female drops 1-2 eggs at a time, which are simultaneously fertilised by her partner.

Hybrids

Hybridisation rarely occurs in nature. I have collected thousands of rainbow specimens and have only encountered two hybrids, both involving an inter-generic cross between *Melanotaenia affinis* and *Chilatherina campsi*. Unfortunately hybridisation in captivity is a very common phenomenon. Without any extra effort on your part, it may occur in community tanks when more than one rainbow species



Spawning behaviour of *Pseudomugil conniae* (a-f)

Chilatherina campsi

is present. There really is no place in the hobby for hybrids. As beautiful as they may be, these fish have lost their genetic integrity and are virtually worthless. **Under no circumstances should they be disseminated in the hobby, whether exchanged or sold.** Either keep them privately or destroy them (hybrid fry make excellent live food for adult rainbows).

Breeding

Rainbows and blue-eyes are usually easy to breed if a few basic requirements are fulfilled. First and foremost you must have at least one member of each sex present (see above section)! Most rainbows and blue-eyes will spawn in either pair or group situations. If groups are used the best results are obtained when a ratio of 2-3 females per male is present. Trios that include a pair of females are also effective spawners. I presently have two tanks of *Melanotaenia pygmaea*. One houses a trio, and the other has nine fish (5 females and 4 males). Over a recent 5-day period the trio produced 154 eggs compared to 136 eggs for the nine fish in the other tank.

Spawning tanks do not need to be elaborate and can be much smaller than your normal display tanks. I use 45-litre tanks for most species, but a smaller tank will suffice for blue-eyes and the smallest rainbows. Filtration is optional. The basic requirements include a thin layer of gravel, moderate aeration, and a spawning medium to receive the eggs. The latter can be either one or more floating mops or a clump of Java moss. Mops are easily constructed by attaching numerous strands of 8 ply, 100% acrylic yarn to a float (cork, plastic, styrofoam, or ring of plastic tubing joined with a plastic connector valve). The mop should be long enough to nearly reach the bottom of the tank as several species prefer to deposit their eggs within about 10 cm of the substrate. Olive green or brown mops seem to work the best.

Copulation of *Pseudomugil signifer*

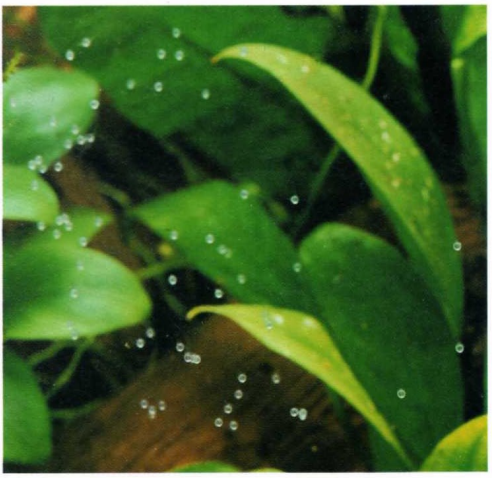
I know that mops work very well, but I subscribe to the "natural method" of using Java moss. I've always used this technique with great success. The only drawback is that if you are using a very large tank with lots of Java moss, it is very time consuming to thoroughly check for eggs. It's best to remove most of the Java moss before breeding is attempted, leaving only a relatively small clump so the eggs will tend to be concentrated.

Healthy fish that have attained sexual maturity will lay eggs almost daily. The numbers fluctuate greatly, but usually anywhere between 2-30 eggs are deposited by a single female each day. The eggs average about 1-2 mm in diameter and are initially clear. They have projecting sticky threads that enable them to adhere to vegetation or spawning mops. Many rainbows and blue-eyes are voracious egg and fry eaters. Therefore, to be on the safe side the eggs should be transferred to a separate hatching container.

Rearing eggs

If you are serious about breeding your fish it is necessary to check for eggs at least every 2-3 days; every day is better if you have the time. I use Java moss as a spawning medium. It takes about 10 minutes to check a small clump thoroughly. The eggs are tough and can withstand short periods (10-15 minutes) out of water as long as they are kept moist. I first squeeze out the excess water from the clump of moss, then pull apart the individual strands. The eggs are readily visible on close inspection. Often they are in clusters of about 2-5 eggs. When one is located, the strand of moss

Copulation of *Pseudomugil gertrudae*



Fresh whirled eggs, sinking down

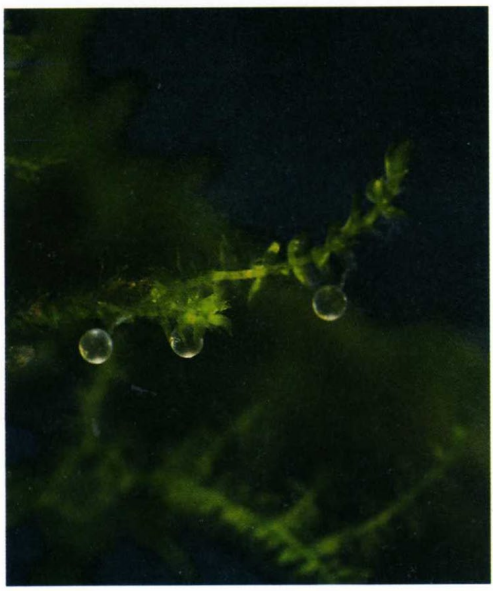
that the egg is attached to is broken off and placed in the hatching container. There are numerous options as far as suitable containers are concerned. I use 2- litre plastic ice cream containers, but almost any glass or plastic receptacle will suffice. Plastic containers are excellent as they can be easily floated in the original aquarium to avoid temperature fluctuations. Egg laden mops or plants are placed in the container which is filled with water from the original aquarium. In the case of Java moss, I often gather eggs over a 4-5 day period, accumulating them in a single 2-litre container, resulting in a total of up to 100 eggs. Hatching times are variable depending on the species and water temperature. At temperatures of 25-28° C the times range from about one week for some *Melanotaenia* to 14-24 days for some of the blue-eyes and species of *Chilatherina.*

Airmail eggs

Melbourne aquarist Ron BOWMAN has cleverly utilised his experience with killifishes to develop a method of sending rainbow and blue-eye eggs around the world via airmail. Here is a description of Ron's technique in his own words (from an article printed in Fishes of Sahul): Plastic 4G vials with screw-top lids are labelled and filled with water from the appropriate tanks. Offcuts of acrylic yarn, 2-5 cm in length, have been soaked and stored in a methylene blue solution and a few of these are placed in each vial.

The mop is taken from the tank and the excess water is removed by gently patting with a towel. Clear fresh eggs are selected and counted into the vial. The acrylic yarn in the vials helps receive the egg - many obstinately stick to the fingers and need to be wiped onto the yarn in the vial. When the order is complete, some more pieces of yarn are inserted above the eggs. With the eggs thus surrounded by yarn, I remove about half the water by inserting the middle finger into the vial like a plunger. The vial is then capped and label details completed. A packing box of 13 mm styrofoam is constructed to accommodate the vials and taped together.

An invoice, listing the contents of the package, is placed along with the small styrofoam box, in a padded postal bag (known as Jiffy Bags here in Australia). The parcel can then be sent via Priority Airmail or similar rapid postal service. Transit time should not exceed seven days for best results.



Swollen eggs in the Java moss

Raising fry

Newly hatched fry are about 4 mm in length. Initially they fall to the bottom, but after 12-24 hours they remain near the surface. Yolk reserves are utilized at first and it is not really necessary to start feeding the fry for about 12 hours. I have used two methods of fry raising with equal success.

The simplest method consists of accumulating several days worth of moss-laden eggs and placing them outdoors in a rectangular plastic tub with a capacity of about 40 litres. This method is obviously limited to summer months if you live in temperate latitudes. The water is aged for at least several days and approximately

Melanotaenia splendida inornata

matches the water chemistry of the spawning tank. A thin layer of gravel is provided, along with a few potted plants or clumps of Java moss. Light aeration is optional. I have good results without aeration. The fry-raising tubs are located in a position that receives morning sun and are kept covered with shade cloth. The fry thrive in this outdoor environment. Natural infusoria, an excellent food source, will often develop after feedings of powdered and liquid formulas are initiated (see below).

The other method is to transfer the freshly-hatched fry (use a small cup or eyedropper) from the hatching container to a clean 2-litre ice cream container filled with water from the original spawning aquarium. Very gentle aeration should be provided in one corner. The bottom of the rearing container is cleaned daily by siphoning off the debris with a short length of small-bore plastic tubing. Up to 25-30 fry are reared in each container. After several weeks they are transferred to an aquarium or outdoor tub. Regardless of the method used, one or two handfuls of shell grit should be added to the rearing tank. **The use of shell grit will result in a higher survival rate and much faster growth.**

Glossolepis incisus

Feeding fry

Contrary to some opinion most rainbow and blue-eye fry can be initially fed commercial dust foods and liquid preparations, without having to resort to cultures of live micro-organisms. I have excellent success with this method. After 1-4 weeks the dry and liquid preparations can be supplemented with newly hatched brine shrimp, vinegar eels, microworms, etc. Small, frequent feedings are best, but not usually practical. I feed my fry only twice daily, in the morning and evening. Here are a few techniques for culturing live foods.

Green water

Standing water that is exposed to sunlight will often turn green due to a "bloom" of microscopic algae. It is a good starter food for rainbowfishes and blue-eyes. In fact, both young and adults of *Iriatherina werneri* will thrive on this food. Any large container that is filled with aged water (pond water is ideal) can be used. It should be placed outdoors in a position that receives a few hours of sunlight each day. Aeration is not vital, but moderate aeration will result in an increased yield. The water should begin to turn green in 1-2 weeks. Another, variation of this method is to cover the bottom of the container with dried pond mud.

Iriatherina werneri

Infusoria

Infusoria refers to single-celled organisms (protozoans). They are very tiny, appearing as a hazy cloud to the naked eye. Any decaying plant matter that produces bacteria for the infusoria to feed on can be used, but brown, rotting lettuce leaves are particularly good. Add enough to cover the bottom of a 2-litre jar and cover the leaves with water that is nearly boiling. Leave the jar uncovered for the first 24 hours, then top it off with old aquarium water and seal. The culture should be ready after about 7-10 days. Turnips can also be used to start a culture. Cut a turnip into small cubes and then dry it in the oven at a low temperature until it is easily crumbled. The dry turnip is then sprinkled on the surface of a plastic or glass container and left outdoors in a shady position for one week. During this period a good batch of rotifers and other protozoans will develop. The

Melanotaenia trifasciata

culture is now ready to transfer to a 2-litre jar or wine bottle, which should be kept sealed for the first week. Both the lettuce and turnip cultures can be maintained by introducing a 2.5 square cm strip of banana skin at weekly intervals. When feeding fry pour the culture liquid directly into the fry rearing container or strain it through fine coffee filter paper. After straining the filter paper can be floated upside down in the fry tank. Take care to prevent overfeeding.

Microworms

Microworms are tiny (1.0-1.5 mm), free-living, non-parasitic nematodes (*Panagrillus silusiae*). The easiest way to start a culture is to obtain at least a teaspoon of

Melanotaenia parkinsoni

worms from someone who is already raising them. Use a 2-litre plastic container with a tight-fitting lid. Add a couple of teaspoons of cooked oatmeal porridge with enough milk to form a solid (not runny), creamy consistency. Other cereal products, such as bread soaked in water or milk, cooked cornmeal, and cooked cracked wheat, can also be used. The ideal temperature for the culture is 25° C. Within a few days thousands of worms will cover the surface of the culture medium. Small flat sticks (such as ice cream sticks) can be used to harvest the worms. Lay the stick on the culture medium and it will soon be covered with worms. The stick is then washed into a container and the worm-filled water is poured directly into the fry tank. To keep the culture going for up to six months add an additional spoon of culture medium every week. It is best to have several separate cultures going at once.

Diseases

Rainbows and blue-eyes are remarkably free of disease in normal circumstances. I have sometimes gone for several years at a time without any disease problems. Often, when obvious diseases do occur, they tend to be isolated incidents affecting only a few fish in one particular tank. It may seem cruel, but I prefer to destroy diseased fish, lest they contaminate others. New fish should be quarantined for 1-2 weeks in order to be absolutely certain that no diseases are evident. Also it is advisable to avoid routinely moving fish from one tank to another, particularly if the water chemistry varies in your fish room. The chance of disease is greatly reduced if your fishes are given plenty of space. This is easier said then done, especially if you are breeding. A very manageable situation, with lots of fry being held in small containers, quickly turns to chaos when the fish begin to grow. Two of the most common crowd-induced diseases are white spot *(Ichthyopthirius multifilis)* and velvet disease *(Oodinium)*. Both are caused by parasitic protozoans. They can be treated

Melanotaenia monticola

Pseudomugil cyanodorsalis

with standard remedies sold by aquarium dealers. There is a large range of so-called "cures", but they vary greatly in quality and effectiveness.

Body and fin fungus *(Saprolegnia)* occasionally attacks rainbows, particularly if they have wounds resulting from fighting or scraping against sharp objects. Chances are the infection will spread to other fishes in the same tank so it is best to treat the entire tank. Increased temperature (up to 5° C if fish are being held at temperatures below 25° C), stronger aeration, bottom cleaning with a siphon, and partial water changes (20 percent) every 2-3 days should help to overcome the problem. If it does not completely disappear, use also a apecial medication.

Melanotaenia arfakensis

Rainbowfishes of Australia

Introducing Australian rainbows

The Australian rainbow fauna consists of 13 species, including four subspecies of *Melanotaenia splendida*. Although there is more than three times as many species in New Guinea, the Australian rainbows have much to offer. The lack of species is certainly compensated for by the numerous, distinctive colour varieties exhibited by *M. trifasciata* and the four subspecies of *M. splendida*.

Rainbows occur in almost every conceivable freshwater environment and are often exceedingly abundant, particularly in the far north. Most of the distribution either lies within the northern half of the continent, or in the southward flowing Murray-Darling river system. Australian rainbows occur primarily in coastal lowlands or at moderate elevations in the interior. Eastern Rainbow *(M. splendida splendida)* populations inhabiting the 1000-metre elevation Atherton Tablelands near Cairns are by far the highest-occurring rainbows in Australia. The Australian continent is extremely old and highly eroded, hence there are few high mountains. The highest peak is Mount Bartle Frere (elevation 1622 m), in the Bellenden Ker Range, just south of Cairns, Queensland. Rainbows are generally absent in steep-gradient fast flowing

Melanotaenia splendida splendida

headwaters. Instead they favour relatively slow-flowing sections of streams or occur in still water.

Origin of Australian and New Guinean Fishes

The fish fauna of Australia and New Guinea is very different to that of South-east Asia, Africa, and South America, which is dominated by cichlids and other "primary" freshwater fishes particularly carps, barbs, loaches, characins and a variety of catfishes. These primary types are considered to have evolved entirely in freshwater. With very few exceptions, the freshwater fishes of Australia and New Guinea, including rainbows, are "secondary" types. In other words they have evolved in relatively recent times from marine ancestors. Families that are mainly marine in other parts of the world have provided the evolutionary nucleus for the present fauna. The most prominent groups in this respect are the silversides (relatives of rainbows), forktail and eel-tailed catfishes, grunters, gobies, and gudgeons.

The very different complexion of the fish fauna compared to other regions is a

Melanotaenia trifasciata

Rhadinocentrus ornatus

reflection of the long period of isolation (approximately 50 million years) since the Australian land mass broke away from Antarctica and began drifting northwards to its present global position.

Even though the Australia-New Guinea continental plate now lie in close proximity to the islands of Eastern Indonesia there is a marked difference between their respective freshwater fish faunas due to their very different geological origins. Indonesia, with the possible exceptions of Timor and western Sulawesi, is part of the Asian continental plate, which until about 20 million years ago was well separated from Australia-New Guinea.

Even today, a barrier of deep oceanic water persists, which effectively prevents the exchange of freshwater fishes. The Dutch ichthyologist Max WEBER delineated the boundary in 1919 and it is sometimes referred to as WEBER's Line. It lies between western New Guinea and the Molucca Islands.

Rainbow taxonomy

Rainbowfishes have been known in the scientific world since 1843 when the British biologist John RICHARDSON published the description of *Atherina nigrans*. A single specimen was collected at Port Essington, near what is now the city of Darwin. Nearly 20 years later the American ichthyologist GILL recognised the distinct nature of this species and placed it in a new genus, which he named *Melanotaenia* (meaning black-stripe) in reference to the distinctive colour pattern. There was relatively little scientific work done on rainbowfishes until the beginning of this century. A greater understanding of the taxonomy resulted from increased collecting activity, mainly by Dutch explorers in western New Guinea between 1900-1925. During this period approximately 20 new species were described, mostly by the Dutch scientists WEBER and DEBEAUFORT. Their studies formed the basis for future investigations and resulted in several classification schemes

Melanotaenia maccullochi

being proposed. Most early authors unanimously agreed that rainbows were members of the family Atherinidae, a large group of mainly marine fishes occurring worldwide in tropical and temperate latitudes.

The Australian ichthyologist Ian MUNRO was the first to recognise the rainbows as a separate family, the Melanotaeniidae. This recognition was published in 1964. In 1980, about six years after first becoming involved in rainbow studies I published the results of a study dealing with the classification of rainbows. This was the first attempt to explain the relationships between the various genera. The study was mainly based on skeletal features, particularly those pertaining to the jaw bones, the pectoral and pelvic girdles, and caudal fin.

Although the results of the study have since been refined, they still form the basis of our present classification. The main alteration has been the elevation of the subfamily Pseudomugilinae to full family recognition. This leaves six genera in the family, which are outlined below. Basically the results of my studies indicate that *Melanotaenia* and the two genera from northern New Guinea, *Glossolepis* and *Chilatherina*, are very closely related and form a "sister" group, which apparently evolved from a common ancestor. They appear to be the most advanced rainbows as far as the development of specialised skeletal features are concerned. The three remaining genera, *Iriatherina, Rhadinocentrus*, and *Cairnsichthys*, which all occur in Australia *(Iriatherina* is also found in New Guinea), exhibit lesser degrees of specialisation, and therefore are considered to be more primitive. They do not have a sister relationship like the other three genera already mentioned. Instead they have evolved along independent lines. The classification of the family is summarised below. Australian genera are indicated in bold type.

Order: Atheriniformes
Family: Melanotaeniidae
Genus: *Melanotaenia* (36 species, including 9 exclusively Australian)
Genus: *Glossolepis* (6 New Guinean species)
Genus: *Chilatherina* (8 New Guinean species)
Genus: *Iriatherina* (1 species - Australia and New Guinea)
Genus: *Cairnsichthys* (1 Australian species)
Genus: *Rhadinocentrus* (1 Australian species)

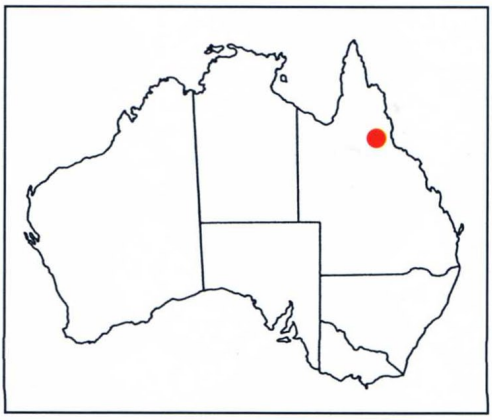
Glossolepis maculosus

Species Section

Cairns Rainbowfish

Cairnsichthys rhombosomoides

(NICHOLS & RAVEN, 1928)



General features: A stream-dwelling rainbowfish from north-eastern Australia, growing to about 8.5 cm, but specimens larger than 6-7 cm are unusual, especially in the wild. Adults are dull yellow-green with a white belly and relatively thin black midlateral stripe. Males have a yellow margin on the dorsal and anal fins. It has a slender body compared to most other rainbows.

Aquarium care: It has the reputation of being a delicate species, but does well in captivity once it is acclimatised. It is very susceptible to handling and transport shock. It also has a poor tolerance to changes in water chemistry, and therefore it is best to ship them in the same water from which they were collected. This same principle applies when introducing new fishes to an aquarium; avoid sudden changes of water chemistry and temperature. Aged water should be used when making periodic (every 1-3 weeks) water changes and only 10-20 percent should be renewed. In the wild this fish lives in fast-flowing streams and therefore the tank should be well aerated and long enough (at least one metre) for active swimming. Feeding is not usually a problem. It will eat most standard aquarium foods. The recommended pH and temperature ranges are 7.2-7.6 and 19-25° C, which simulates those found in nature.

Cairnsichthys rhomboosmoides

Breeding: There is very little information, but an informative article by David STEPHON was published in *Rainbow Times* (published by the Rainbowfish Study Group, Inc., USA). STEPHON conditioned his young fish by keeping them in a community tank with other rainbows. Growth was rapid with feedings of beef heart, chopped earthworms, and brine shrimp. The fish grew from 2.5 cm to 6 cm in just over three months and were ready for spawning. Eight fish were then placed in a 38-litre tank with pH 7.6, conductivity 100 mS, temperature 25.5° C, and medium aeration. A few floating plastic plants and a dark green mop were placed in the otherwise bare tank. It was illuminated by a strip of Actinic-03 lights, more or less simulating the subdued lighting in the natural rainforest habitat. It took a few weeks, but the fish eventually filled the mop with eggs. Copious feeding of whiteworms and weekly water changes continued to simulate the fish to lay a few eggs each morning. The eggs were picked out of the mop and placed in a hatching tray that was floated on the surface of a separate rearing tank. The fry hatched in about 7 days and were immediately started on newly hatched brine shrimp.

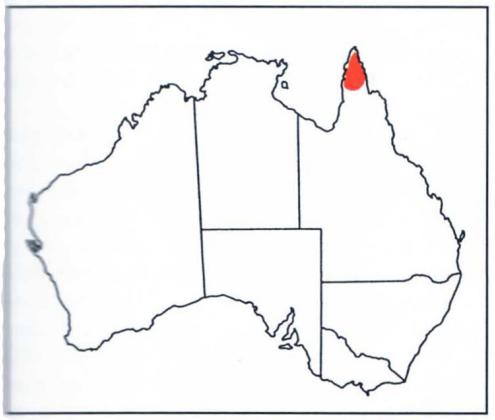
Distribution and Natural Habitat: The habitat is situated in far northern Queensland, close to the Pacific coast between Cairns and Innisfail. The fish is mainly restricted to small streams draining the Bellenden Ker Range, an imposing cluster of peaks that rise steeply from the coastal plain. The mountain range extends for about 25 kilometres and is entirely circled by the Mulgrave and Russel River systems. *Cairnsichthys* is restricted to creeks in the lower foothills. It is rare or absent on the coastal plain, which lies to the east of the mountains and is planted with sugar cane. The habitat consists of small, clear rainforest creeks with alternating sections of rapids and rocky pools. Depth of the streams ranges from a few cm to about 3 m. The bottom is usually composed of boulders, cobbles, and gravel with minimal aquatic plants. It is sometimes found with *M. splendida* and *M. maccullochi* on the edge of the coastal plain.

Status: The species was first collected in October 1921 by the American H.C. RAVEN in the Babinda Creek drainage. It was not introduced into the aquarium trade until the 1980's. Due largely to its sombre coloration and reputation of being a difficult fish, it has not gained wide acceptance in the hobby. It really is a fish suited more for the specialist. *Cairnsichthys* has a very limited geographic range, although it is abundant in several creeks, particularly those flowing into the Mulgrave River in the vicinity of Goldsborough. It's future seems secure as long as the rainforest habitat of the Belenden Ker Range is protected. Much of the area is now a National Park.

Threadfin Rainbowfish
Iriatherina werneri
MEINKEN, 1974

General features: A swamp and stream-dwelling species from south-central New Guinea and Cape York Peninsula, Australia, not usually exceeding about 4 cm. Males display elongate, thread-like filaments and more brilliant fin coloration (frequently yellow to reddish first dorsal fin and reddish caudal fin lobes). General body coloration is brownish with silvery reflections, darker brown on back, especially in males. New Guinea fish are generally darker than Australian fish, particularly males.

Aquarium care: A relatively easy species to maintain in captivity if certain precautions are taken. It is particularly susceptible to transport-related shock. Make every effort to avoid this condition when introducing freshly purchased fish to your aquarium. Acclimatise the fish by gradually diluting the water in the holding bag with aquarium water over a period of 1-2 hours. Sudden changes in temperature, pH, and hardness should be avoided. Due to their small size and peaceful disposition it is best to keep threadfin rainbows in a tank by themselves or with juveniles of other rainbow species. Water changes at 2-4 week intervals are recommended, in which about 20-30 per-



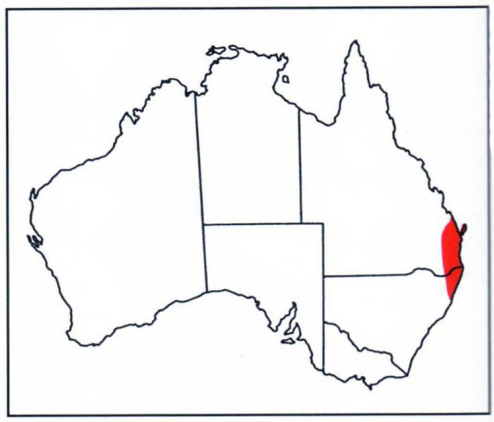
cent of the content is exchanged. Recommended water temperature and pH are 25-28°C and 6.0-7.5 respectively. This species does best in a well planted aquarium, which simulates the natural habitat.

Breeding: Once established in aquarium conditions this species is relatively easy to breed, but the fry may prove difficult to raise. Frequent water changes and regular feeding of live foods such as baby brine shrimp and *Daphnia* will quickly bring the fish into spawning condition. Courtship behaviour is easily observed and very spectacular. The males fully extend their first dorsal and anal fins with a "flicking" action. Spawning mops or abundant Java moss should be provided to receive the very tiny eggs. The spawning medium with attached eggs should be transferred to a nursery tank. Recommended starter foods for the fry include infusoria, cooked egg yolk (squeeze through a fine mesh cloth), or eggcake flour.

Distribution and Natural Habitat: It is abundant in swampy lowland areas between the Fly River and the Irian Jaya border. Collecting localities include the Fly, Pahoturi, Morehead, and Pahoturi rivers. In 1975 the author discovered this species in the Jardine River at the tip of Cape York Peninsula, Australia. Subsequent investigations by members of the Australia New Guinea Fishes Association have located additional scattered populations on Cape York Peninsula. Collection localities include billabongs and swampy lagoons near Weipa and along the Edward River, both in the Gulf of Carpentaria Drainage and the mouth of the Harmer River, in the Pacific watershed. The habitat consists of slow-flowing streams, swampy ponds, and billabongs with abundant aquatic vegetation. These sites frequently have growths of floating lily pads. The pH at Cape York sites varies between 5.5 and 6.5. Threadfins form large schools and are easily caught with a fine mesh net, but special care should be exercised when handling and transporting these delicate fishes.

Iriatherina werneri

Habitat of *Iriatherina werneri*, Jardine River, North Queensland



Status: This species was first discovered in an irrigation ditch near the town of Merauke in the south-eastern corner of Irian Jaya. It was introduced to the European aquarium hobby in 1974 by A. WERNER. Initially only males were available, but both sexes are now readily obtainable. The species is well established, but perhaps not as popular as it should be in spite of the very spectacular appearance of adult males. This is no doubt due to its delicate nature and the need to keep it separate from most other fishes. Also, it is not a very long-lived fish, the maximum life span being only about two years. However, advanced hobbyists will agree that this is one of the most rewarding species to cultivate.

Crimson-Spotted Rainbowfish
Melanotaenia duboulayi
(CASTELNAU, 1878)

General features: A stream-dwelling rainbowfish from the central coast of eastern Australia, growing to about 11 cm, but usually less than 8.5 cm. Colour pattern is variable depending on locality. The body often has a silvery blue-grey to yellow-green wash and there is a narrow red stripe between each horizontal scale row. A dark, mid-lateral stripe is frequently evident, or sometimes just a diffuse bluish region towards the base of the tail. Fins range from yellow or reddish to clear. Those of adult males have small red spots, mainly on the basal half. Males may have blackish margins on the dorsal, anal, and anterior

Melanataenia duboulayi

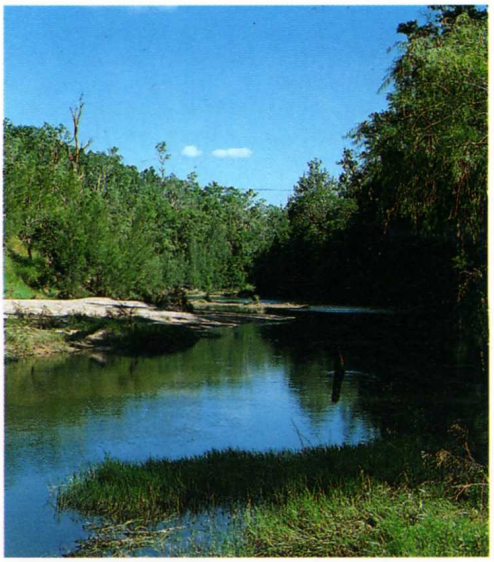
margin of the pelvic fins, especially during courtship and spawning. Older males develop a deep body and humped forehead.

Aquarium care: An excellent aquarium fish without any special requirements. It is suitable for a community tank with other rainbows, gobies, and gudgeons. It also makes a very nice display if kept separately. A 70-litre tank is suitable for up to about 10 adult fish. Recommended temperature and pH ranges are 23-28° C and 6.5-7.2, although the natural range greatly exceeds these values.

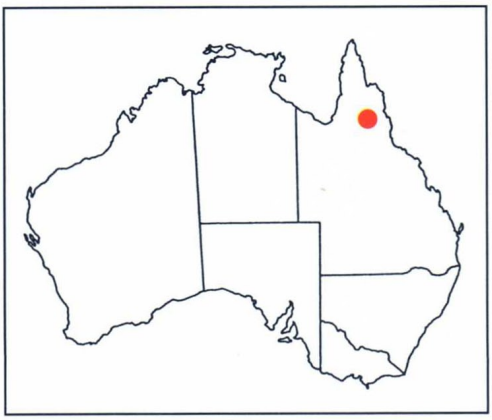
Breeding: A prolific spawner in captivity. It will spawn in group situations, as well as in pairs or trios (with a pair of females). The best conditioning is achieved with soft (total hardness 40-100 ppm), slightly acidic (pH 6.5-7.0) water and regular offerings of live food. Either mops or Java moss can be used as a spawning medium. Check for eggs every 2-3 days, transferring them to a separate hatching container. The incubation period is about one week at 25-28° C. Growth of the fry is rapid if fed properly (infusoria, baby brine shrimp, etc.). A length of about 2 cm is attained after only eight weeks.

Distribution and Natural Habitat: The distribution includes the narrow coastal strip, east of the Great Dividing Range, between the Macleay River, northern New South Wales to Hervey Bay and Fraser Island, southern Queensland. Habitat consists of streams, lakes, ponds, and reservoirs. It is often found in coastal dune lakes and also occupies this habitat, as well as creeks, on Fraser Island. Streams are relatively clear, although sometimes tannin-stained, with minimal flow and plentiful exposure to sunlight. Temperature and pH ranges are 18-30°C and 5.3-7.2. Other species found in the same habitat include *Rhadinocentrus ornatus*, *Pseudomugil mellis*, and *P. signifer*.

Status: It was first collected in the 1870's in a freshwater lagoon connected to the Richmond River in New South Wales by a man named DUBOULAY. This is perhaps the first Australian fish to be kept in captivity and was first sent overseas to Germany in 1927. Four specimens were received by the Berlin Aquarium, of which two survived. Fortunately these were a pair and the curator, Mr. REHACZEK, was able to successfully breed them. It was apparently introduced in America soon afterwards. For many years it was erroneously sold as *M. nigrans*. The classification of this species has been confused for many years. I originally considered it as a subspecies of *M. splendida*. A study which I published in conjunction with Macquarie University (Sydney) researchers, Lucy CROWLEY and Walter IVANTSOFF, revealed that it is a distinct species. We also separated it from the inland-dwelling *M. fluviatilis*, which was formerly believed to be a variety of the same species. The Crimson-spotted rainbow is still common in many parts of its range, but pollution, logging, dam construction, housing developments and land clearing have combined to reduce the available habitat.



Habitat of *Melanotaenia duboulayi*, Mary River, Southeast Queensland



Lake Eacham Rainbowfish

Melanotaenia eachamensis

ALLEN & CROSS, 1982

General features: A lake-dwelling rainbowfish from north-eastern Australia, growing to about 6.5 cm. The colour is olive or brownish on the back and silvery on the sides. A narrow brownish stripe may be present between each horizontal scale row, but they are poorly defined. Dorsal, anal, and caudal fins are reddish; those of males may have weak spotting near the base.

Aquarium care: It is a peaceful rainbow that does well in captivity. Due to its relatively small size it's best to maintain it separately or in a community tank with other small rainbows and blue-eyes. A 30-40 litre tank is suitable for a group of 8-10 fish. The pH and temperature requirements are 23-27° C and 7.0-7.4.

Breeding: Spawns readily in either pairs or group situations (2-3 females per male) when supplied with Java moss or floating mops. Eggs and fry can be isolated or left with the parents, provided there is dense vegetation. Care of the young is similar to that recommended for other rainbows.

Distribution and Natural Habitat: The species was originally believed to be restricted to Lake Eacham, a 53-hectare crater lake, situated on the Atherton Tablelands, about 40 kilometres south-west of Cairns, Queensland. Situated in senic rainforest at an eleva-

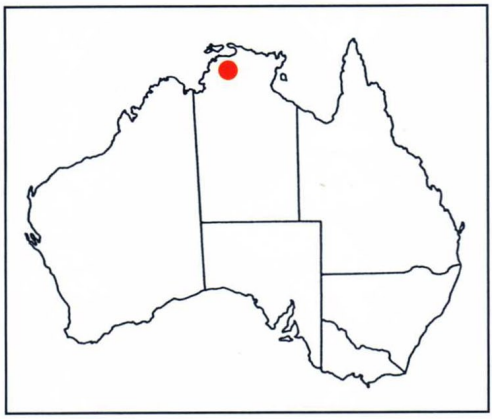
Melanotaenia eachamensis

tion of 746 metres, the lake, has an average depth of 149 metres. Although the fish is now extinct in this lake, it was recently discovered in Dirran Creek and at Lake Euramoo, which are located 22 km south and 14 km north respectively, of Lake Eacham.

Status: More than any other rainbowfish, this species has attracted the attention of conservationists and government authorities. It was believed to be the only fish species to have become extinct in the wild since Australia was settled by Europeans. The demise of this fish in Lake Eacham is the direct result of human carelessness and a flagrant disregard of the consequences of fish translocation. The fish was very common around the shallow margin of Lake Eacham during the 70's. I first collected it in 1978, but did not recognise it as a distinct species until 1982. It is not a spectacular fish compared to other rainbows, therefore it attracted very little attention. A few Australians, specialising in native fishes, occasionally collected it. Small numbers were therefore present in the hobby during the 70's and 80's. The fate of *M. eachmensis* was revealed in 1987, when a fish collecting survey by the Queensland Fisheries Department failed to find a single rainbow out of 1500 sampled specimens. Instead, they collected five other species: Mouth Almighty *(Glossamia aprion),* Archerfish *(Toxotes chatareus),* Bony Bream *(Nematalosa erebi),* Banded Grunter *(Amniataba percoides),* and Fly-specked Hardyhead *(Craterocephalus stercusmuscarum).* Prior to 1978 only three species were present: the rainbow, hardyhead, and Northern Trout Gudgeon (*Mogurnda mogurnda*). So what happened to the rainbow and gudgeon, and where did the four intruders come from? The four introductions are apparently common in nearby Tineroo Reservoir. Apparently they were deliberately released in Lake Eacham, probably by a fisherman who was unhappy with the variety of tiny fishes in the lake and yearned for something larger. The Australia New Guinea Fishes Association (ANGFA) has been instrumental in saving the Lake Eacham fish from total extinction. A survey of members in 1987 revealed there were 24 captive fish in Australia. A concerted effort was made to breed these fish and a quantity of young was eventually given to the Walkamin Research Station (Queensland Department of Primary Industry) and Taronga Park Zoo for captive breeding programs. Thanks to these efforts large numbers of the fish still exist in captivity. A trial reintroduction of about 1000 fish was attempted in Lake Eacham a few years ago, but a follow-up survey indicated it was unsuccessful. Certainly it will be necessary to eradicate the predatory introductions, particularly the grunter, archerfish, and mouth almighty, before there is any hope of success.

Fortunately, the story of the Lake Eacham rainbowfish has a happy ending. I collected a fish that appeared to be very similar to *M. eachamensis* at Dirran Creek, about 22 kilometres south of Lake Eacham, with David LIDDLE in early 1988. A preliminary electrophoretic analysis of this population by researchers at Macquarie University in Sydney indicated that both the Dirran Creek fish and *M. eachamensis* were only variations of ehe widely distributed *M. splendida splendida.* However, a study by Dr. Craig MORITZ of the University of Queensland in 1994, involving analysis of mitochondrial DNA, has conclusively shown that *M. eachamensis* is clearly distinct from *M. splendida.* The most surprising result of this study is that *M. eachamensis* is not extinct in the wild. The DNA analysis revealed that pure populations of this species are common in Dirran Creek, and also at Lake Euramoo, a tiny crater lake about 14 km north of Lake Eacham.

Habitat of *Melanotaenia eachamensis,* Lake Eacham, North Queensland



Exquisite Rainbowfish

Melanotaenia exquisita

ALLEN, 1978

General features: A stream-dwelling rainbowfish from northern Australia, growing to about 7.5 cm. Adults are olive on the back and silvery white on the lower half. There is a pair of prominent black stripes running along the middle of the side with a red stripe just below. A pair of dark "zigzag" stripes are situated between the red stripe and base of the anal fin. The dorsal, anal, and caudal fins are red, frequently with small black spots. Males are relatively slender compared to that of most other rainbows.

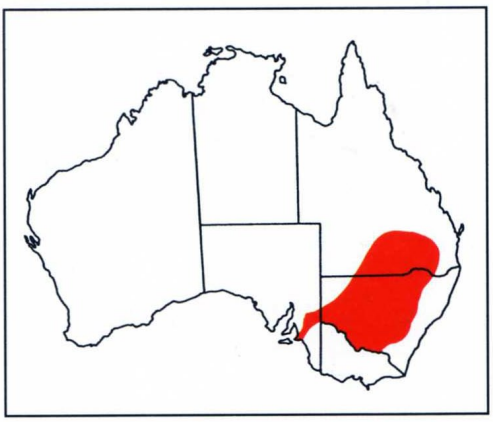
Aquarium care: It is a relatively small species, but is a fast swimming fish that requires a bit of space. A tank length of at least one metre is ideal. Frequent water changes, every 7-10 days, in which about 25 percent of the contents is renewed, will ensure optimal health. A wide range of standard dry, frozen, and live fish foods are acceptable.

Breeding: There are no special requirements. It will spawn daily if mops or mats of Java moss are provided. The eggs hatch in about 10 days at 25° C. The fry can be fed infusoria and powdered food before progressing to larger items such as baby brine shrimp and vinegar eels.

Melanotaenia exquisita

Distribution and Natural Habitat: It occurs mainly in streams of the Northern Territory, except for a recently discovered population in the King George River of Western Australia. All of these streams flow into the Timor Sea. Northern Territory sites are mainly in upland areas of the Katherine, Edith, Mary, South Alligator, and Fergusson rivers. It typically inhabits small, clear, swift-flowing streams, often congregating in rocky pools at the base of small waterfalls. The species is sometimes found above high waterfalls, for example King George Falls in Western Australia, Jim Jim Falls in the South Alligator system, and 17-Mile Falls in the Katherine system. It also occurs in the still waters of Lake Malkyullumbo at the base of Edith Falls.

Status: The species was discovered by the author at Edith Falls in 1977. It has since entered the aquarium trade largely due to the efforts of Darwin-based aquarists. ANGFA members in Melbourne have also been instrumental in breeding captive stocks. The fish is now widely distributed in the hobby, but in relatively small numbers. It's small size, peaceful disposition, and colourful pattern is sure to attract more hobbyists in the future. The species is locally abundant within its rather limited geographic range.



Murray River Rainbowfish

Melanotaenia fluviatilis

(CASTELNAU, 1878)

General features: A stream-dwelling rainbowfish from the central coast of eastern Australia, growing to about 11 cm, but usually less than 8.5 cm. As with most *Melanotaenia*, the colour is variable depending on locality and water conditions. The basic pattern is olive, brownish, or slightly turquoise on the back and upper side grading to white on the lower half. A thin, reddish or brown stripe is situated between

Habitat of *Melanotaenia exquisita*, Moline Gorge, Northern Territory

Melanotaenia fluviatilis

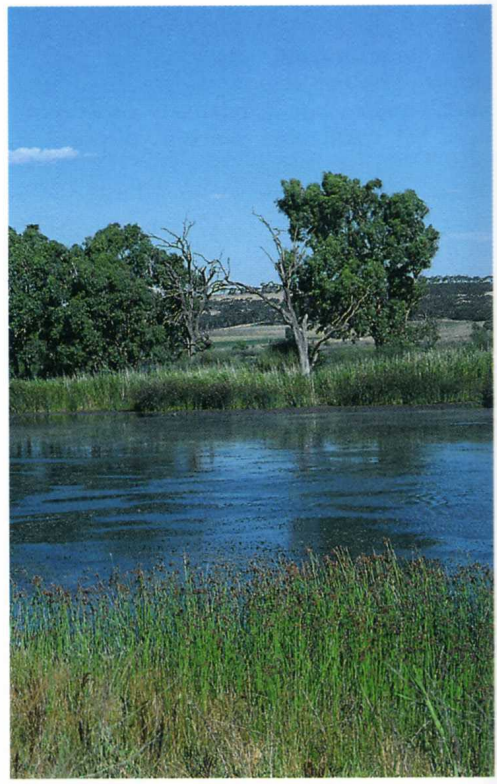
each horizontal scale row, particularly in mature males. There is sometimes a blackish, mid-lateral stripe. Fins are clear to reddish, sometimes with faint spotting. Males may have blackish margins on the dorsal, anal, and anterior margin of the pelvic fins, especially during courtship and spawning. Victorian fish often have a broader head and blunter snout compared to fish from the northern part of the range.

Aquarium care: Similar to *M. duboulayi* (see above). Fish from South Australia and Victoria are adapted to cold winter temperatures. Data from Victorian populations suggest they are able to withstand water temperatures as low as at least 10° C. Therefore, this fish should be suitable for outdoor ponds in temperate climates.

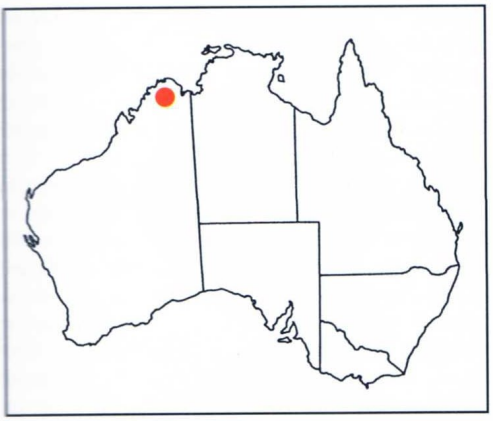
Breeding: Similar to *M. duboulayi* (see above), but natural populations exhibit more seasonality in their spawning patterns. Peak spawning occurs during late spring and summer when the water temperature exceeds about 20° C.

Distribution and Natural Habitat: This is the most southward ranging rainbow and the only species adapted to low winter temperature regimes (normally about 10-15° C). Nevertheless, winter temperatures appear to be the limiting factor that prevents its dispersal farther southward. The distribution encompasses the Darling river system from Roma, Queensland (26° 35'S, 148° 53'E) south to the Murray River and its tributaries in New South Wales, Victoria, and South Australia. The Campaspe and Goulburn rivers in Victoria represent the southern limit of distribution (approximately 36° 45'S). The habitat consists of streams, backwaters, drainage ditches, overflows, ponds, and reservoirs. Fish congregate along grassy banks or around submerged logs and branches.

Status: It was first captured in the 1870's in the Murrumbidgee River of New South Wales by an unidentified collector. Until recently it was considered to be the same species as *M. duboulayi* (both were referred to as *M. fluviatilis*). The species has never generated much interest among Australian aquarists, except for a few native fish specialists. It is still relatively unknown in Europe and America. Northern populations in the Darling River system appear to be relatively abundant, although modern surveys are required in southern Queensland and northern New South Wales. It is reasonably common in the Murray River downstream of the junction with the Darling. However, Victorian populations seem to be increasingly rare. A recent survey by N. ROMANOWSKI yielded fish at only a few locations, including Mitchell's Creek near Nagambie and the Goulburn River near Shepparton. There is evidence that numbers are seriously reduced during winter droughts, when water temperatures dip below 10° C.



Habitat of *Melanotaenia fluviatilis*, Murry River, Southern Australia



Slender Rainbowfish

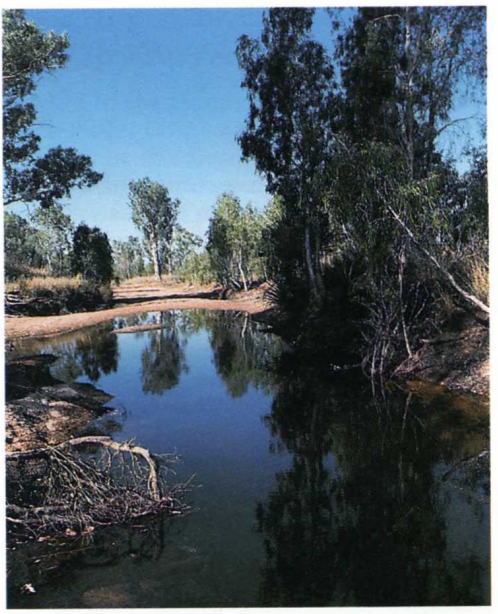
Melanotaenia gracilis

ALLEN, 1978

General features: A stream-dwelling rainbowfish from north-western Australia, growing to about 7 cm. The back and upper sides are greenish or olive brown grading to mauve below with a dark mid-lateral stripe. Males have a red margin on the dorsal and anal fins and red tips on the caudal-fin lobes. Faint red spotting is sometimes present on these same fins. Adult males are noticeably slender compared to most other rainbows.

Aquarium care: There is little information, but probably similar to most other rainbows. Temperature and pH ranges of 23-28° C and 6.8-7.0 will simulate those occurring in the natural habitat.

Melanotaenia gracilis



Habitat of *Melanotaenia gracilis*, Drysdale River, Western Australia

Breeding: No information, but probably similar to other rainbows, such as *M. nigrans* (see below).

Distribution and Natural Habitat: Known only from the Drysdale and King Edward Rivers in the remote Kimberley region of far northern Western Australia. It is found in clear, slow-flowing streams that are lined with paperbarks, *Eucalyptus*, and *Pandanus* palms. Large numbers congregate in shady pools around log snags and submerged branches.

Status: It was first discovered in 1975 by Barry HUTCHINS, Curator of Fishes at the Western Australian Museum. I collected a few live individuals two years later, but unfortunately most of these fish perished soon afterwards. A further collection was obtained by Brisbane aquarist Ray LEGGETT in 1986, but the species remains poorly known in the aquarium hobby. The species is abundant in the wild within its very restricted geographic range.

MacCulloch's Rainbowfish

Melanotaenia maccullochi

O'GILBY, 1915

General features: A stream and swamp-dwelling rainbowfish from northern Australia and south-western Papua New Guinea, growing to about 6-7 cm. Adults are silvery white, sometimes with a yellow tinge, and marked with 6-8 narrow reddish-brown stripes on the side. Two distinct colour varieties exist. Fish from northern Cape York Peninsula and Papua New Guinea are more colourful. They frequently show yellow hues on the fins and body, and possess a pair of bold black stripes on the dorsal and anal fins. Fish from coastal Queensland are generally more drab, with less intense body stripes and either lack the prominent fins stripes or have very weak ones. However, they may have beautiful red fins and are often referred to as Red-finned rainbows.

Aquarium care: This is an excellent aquarium fish, well suited for a community tank due to its small size and peaceful disposition. It requires very little in the way of special care, other than the usual water changes and occasional offerings of live food. It tolerates a wide range of pH and temperature, but the recommended values are 24-28° C and 6.5-7.5.

Breeding: It will readily spawn in either mops or Java moss. Once they are properly

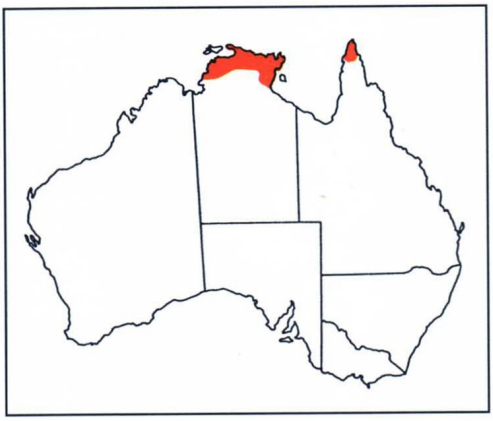
Melanotaenia maccullochi

conditioned spawning occurs daily, each female releasing several eggs. Males signal their intent to spawn by flashing a yellow streak on top of the head and nape. Sometimes, particularly if well fed, the adults will ignore the eggs and fry, but to be on the safe side it is best to place the eggs in a separate hatching container. Hatching takes about 8-9 days at 27-28° C. The fry should be fed several times daily on the usual diet of infusoria, egg yolk infusion, powdered foods, vinegar eels, etc. After about one week they are large enough to eat newly hatched brine shrimp. A size of about 1.2 cm is attained in two months and 3.0-3.5 cm after five months. It is one of the smallest members of the genus with sexual maturity being attained at a length of only 3-4 cm.

Distribution and Natural Habitat: The Papua New Guinea population inhabits the lower and middle sections of the Fly River, extending westward to the Bensbach River, which is very close to the Irian Jaya border. It probably occurs on the other side of the border, but no collections have been made there. It is not found in the main Fly River or the larger tributaries, instead it prefers floodplain swamps and small creeks. It is usually found in clear, acidic waters (pH 5.5-6.5) with abundant shelter in the form of aquatic plants and log debris. There appears to be several geographically separate populations in northern Australia. It occurs on the narrow Queensland coastal plain between Cairns and Cardwell. It is not found in most areas north of Cairns, probably due to the absence of coastal plain habitat. However, it reappears in rainforest creeks on the northern bank of the Daintree River (90 kilometres north of Cairns), and at the McIvor River (about 80 kilometres north of Cooktown). The northernmost population in Queensland occurs at the tip of Cape York Peninsula in the Jardine River and its tributaries. There are also recent reports of this species from the vicinity of Darwin in the Northern Territory.

Status: The species was first described in 1915 on the basis of specimens from the Barron River near Cairns. It has a very long history in the international aquarium trade. The first specimens were exported in 1934 to the Hamburg Aquarium. It was successfully bred, resulting in its rapid dispersal in the European hobby. A short time later the fish made its first appearance in America. Wild populations are still abundant in New Guinea and on the northern tip of Cape York Peninsula, but the more southerly populations along the Queenland coast are no doubt declining due to habitat destruction. The extensive development of coastal plain sugar cane has contributed to the demise of this species. It is now confined to a relatively few widely scattered locations and has long been absent in the Barron River, the site of its first capture.

Habitat of *Melanotaenia maccullochi*, near the Jardine River, Queensland



Black-banded Rainbowfish

Melanotaenia nigrans

(RICHARDSON, 1843)

General features: A stream-dwelling rainbowfish from northern Australia, growing to about 8.5 cm. The colour is grey brown on the back and white on the lower sides with a prominent black mid-lateral stripe. Males are relatively slender compared to most rainbows.

Aquarium care: A peaceful fish that thrives in captivity. It is suitable for a community tank with other small rainbows, gudgeons, and gobies. It prefers soft (total hardness 0-50 ppm), acidic waters in the wild, but can be maintained in slightly alkaline conditions (pH 7.0-7.5) if gradually acclimatised.

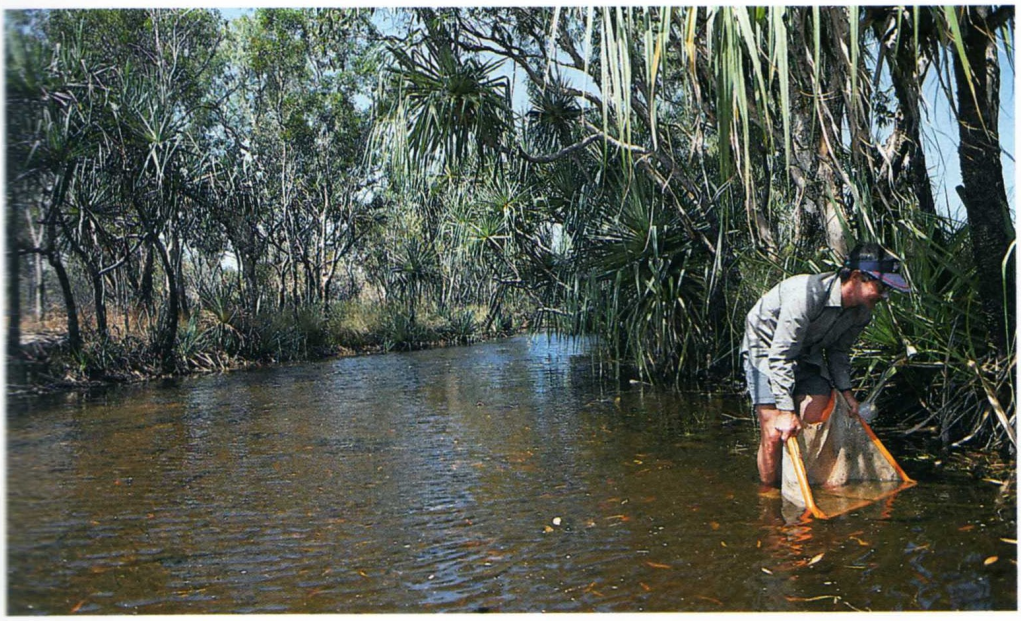
Breeding: The best breeding results are achieved if the tank receives 1-2 hours of early morning sunlight, but this is not absolutely vital. Some breeders drop the water level to about 50-75 percent capacity, and then add a small quantity of rainwater to induce spawning. A simple breeding set-up consists of a single pair of fish in a 30-40 litre tank that is supplied with a layer of gravel, subgravel filter, and either a large clump of Java moss (extending from the bottom to the surface) or 1-2 floating mops. Fish will be more likely to spawn if regular feedings of live food are offered. This is one of the most prolific species as far as egg numbers are concerned. Each

Melanotaenia nigrans

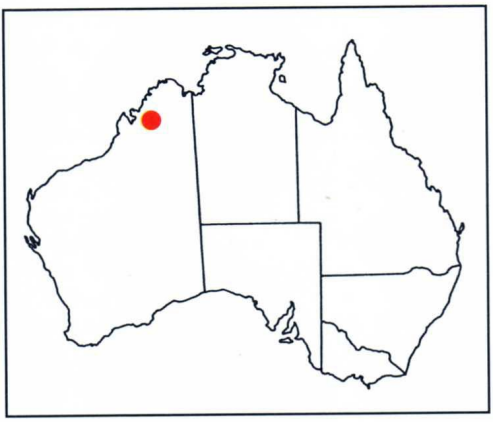
female deposits up to about 50 eggs per day. Check for eggs every 2-3 days and remove them to a separate hatching container. Incubation lasts for about one week at 25-27° C.

Distribution and Natural Habitat: There are three geographically separated populations in northern Australia: the eastern Kimberley Region (Napier Broome Bay) of Western Australia, northernmost portion of the Northern Territory and Groote Eylandt (a large island in the Gulf of Carpentaria), and northern tip of Cape York Peninsula including Prince of Wales Island. It has been erroneously reported from southern New Guinea, but these records invariably apply to misidentifications of *M. goldiei.* The habitat is variable and incudes rainforest streams, lily lagoons, and small creeks in swamp country. It is sometimes found in larger rivers such as the Jardine (on Cape York Peninsula) and the Darwin (in the No. Territory), usually in quiet backwaters or along the shoreline where there is reduced flow. It usually occurs within about 40 kilometres of the sea, but has been found as far as 130 kilometres inland. Other rainbows and blueeyes found in the same habitat include *M. splendida australis, M. splendida inornata, M. maccullochi, M. trifasciata, Iriatherina werneri,* and *Pseudomugil gertrudae.*

Status: *M. nigrans* has the distinction of being the first rainbowfish to be scientifically described. It was collected by a man named Mr. GILBERT in the early 1840's from freshwater streams around Port Essington, Northern Territory. He stated that it was abundant and could easily be taken with a hook baited with flies or fresh meat. The local aboriginal people referred to it as "Yalgunda". The species has been maintained by Australian aquarist for many years, but has never achieved great popularity. It is virtually unknown in Europe and America, although a few specialists are holding stock that originated from egg exchange programs with ANGFA members. For many years *M. duboulayi* was mistakenly sold in Europe under the name *M. nigrans.* Wild populations are still abundant, although the distribution is very patchy and dependent on certain ecological conditions.



Habitat of *Melanotaenia nigrans,* Pago Creek, West Australia



Pygmy Rainbowfish

Melanotaenia pygmaea

ALLEN, 1974

General features: A stream-dwelling rainbowfish from north-western Australia, not exceeding about 5 cm. Males display a more brilliant colouration consisting of a metallic sky-blue back, a blackish mid-lateral stripe, and pale yellow fins.

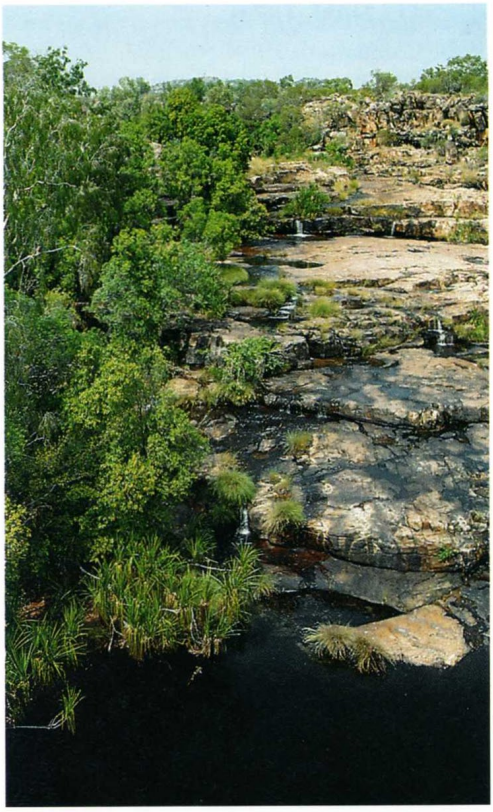
Aquarium care: It is an easy species to maintain in captivity. Due to their small size and peaceful disposition it is best to keep pygmy rainbows in a tank by themselves or with other small rainbow species (such *as M. maccullochi* or *M. sexlineata*). Water changes at 2-4 week intervals are recommended, in which about 25 percent of the content is exchanged. The new water should be dechlorinated as this species is very intolerant of this chemical. Recommended water temperature and pH are 24-28° C and 6.8-7.2. Hiding places in the form of rocks or plants should be provided for females as courting males may be overly aggressive.

Melanotaenia pygmaea

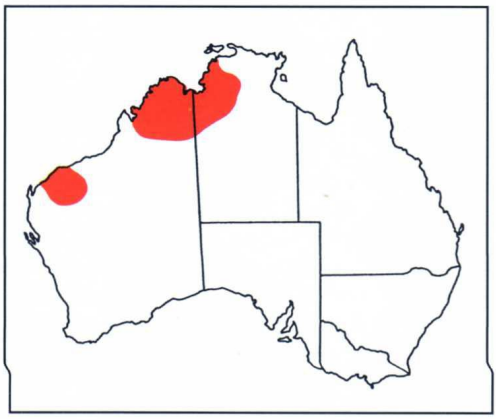
Breeding: I usually breed this species in groups containing 3-15 fish in which females are more numerous than males. This species will spawn daily, usually during the morning, in either mops or Java moss. It apparently has a voracious appetite for its own eggs and therefore I have better success using a thick mat of Java moss. The egg-laden moss is removed and replaced once or twice daily and placed in a separate hatching container. I use outdoor tubs covered with shade cloth, a method which of course is suitable only during summer if you live in temperate latitudes. The outdoor tubs usually develop a good supply of natural infusoria. They are not aerated. Hatching takes about 10-14 days at 25° C. Several feedings of powdered dry food and Liquifry are given each day until the young are large enough to eat freshly hatched brine shrimp.

Distribution and Natural Habitat: Known only from two small tributaries of the Prince Regent River in the West Kimberley district of northern Western Australia. The Prince Regent River is situated about 260 kilometres north of the port of Broome. It can be reached only by boat or a treacherous overland walk that would require more than one week from the nearest road. Most specimens have been captured at Cascade Creek. This scenic locality is situated approximately 20 kilometres up the main channel of the Prince Regent River. The creek plunges over a series of bare rock terraces before entering a large deep pool with an area of about 0.5 hectares. A short distance downstream the creek drops over the spectacular 80-metre high King's Cascade into a mangrove-lined inlet of the Prince Regent. The main river is brackish at this point and undergoes a huge 7-metre twice daily tidal fluctuation. The inlet at the base of the falls is patrolled by sharks *(Carcharhinus amboinensis)* and large saltwater crocodiles. It was the site of a fatal crocodile attack in 1987. The Pygmy rainbow is common in small rivulets that wash across the terraces and is also present in the large pool. The species has an affinity for highly oxygenated water and is frequently found at the base of small waterfalls. It is usually seen in schools that contain just a few fish to more than 50 individuals.

Status: This species was first discovered by the author above King's Cascades in 1974. Live specimens were also collected on this visit, but perished after a year in captivity. Two additional collections were made by the author in 1992 and 1994. These are now thriving in captivity and specimens have been dispersed to ANGFA members. The species is still virtually unknown in the hobby, but will certainly secure a prominent place in the future. It has great attributes as an aquarium fish including a small size, peaceful disposition, and an attractive colour pattern.



Habitat of *Melanotaenia pygmaea*, Cascade Creek, West Australia



Western Rainbowfish

Melanotaenia splendida australis

(CASTELNAU, 1875)

General features: A mainly stream-dwelling rainbowfish from north-western Australia, growing to about 11 cm. The colour, particularly of the fins and intensity of the mid-lateral stripe, is highly variable depending on geographic locality. The most common theme is olive or brownish on the back and white below with a diffuse dark mid-lateral stripe and narrow reddish stripes between most of the horizontal scale rows. Fins range from nearly colourless to deep red, or clear with red flecks. The real "trademark" of this species is the pair of zigzagging blackish lines on the lower sides, just above the anal fin. The black mid-lateral stripe may be very prominent (for example in populations from the King George River of Western Australia and South Alligator River in the Northern Territory) or scarcely apparent (as in fish from the Pilbara region of Western Australia). Fish from the Drysdale River of Western Australia are generally smaller in stature and possess a distinctive double mid-lateral black stripe.

Aquarium care: This is perhaps the most adaptable of all rainbow species. It will thrive in captivity under a wide variety of conditions. A huge range of water conditions is also encountered in the natural habitat. Temperature and pH values range between 23-32° C and 6.5-7.8. There is often a large fluctuation in water quality between the dry and rainy seasons. This phenomenon is particularly prevalent where headwaters flow from limestone areas. In such places the pH may range from nearly 6.0 to 8.0 with an accompanying variation in hardness, depending on the season. According to an article by Ron BOWMAN in *Fishes of Sahul* (published in Australia by ANGFA), the brightest colours can be achieved by using soft, tannin-stained water. This condition is produced by using peat moss filtering and very gradual water changes. BOWMAN claims that many varieties of *australis* respond best with a seasonal variation of water quality - more calcium hardness in the dry season (April-October) and soft water achieved by more frequent changes and peat filtration in the hotter wet season (November-March).

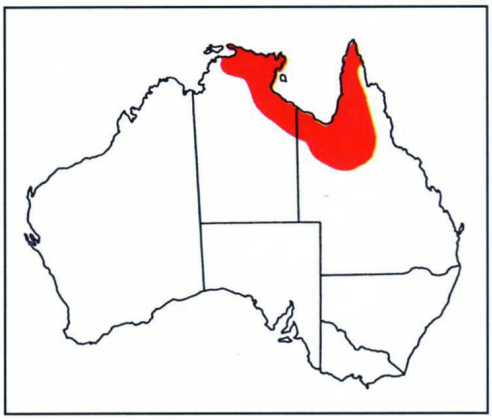
Breeding: Group spawning works well. I usually use 2-4 females for each male. They do not require much space. Ron BOWMAN breeds them in a 20-30 litre tank. I have good success using square tubs with a similar capacity, placed outdoors during the summer and protected with shade cloth. The fish spawn readily, usually every morning, in either mops or Java moss. The eggs can be removed to a separate hatching container, but I get excellent results, in my outdoor setup, leaving them with the adults, as long as there is a dense mat of Java moss (covering about half of the tank space). The fry are tiny, but grow quickly when fed with infusoria, Liquifry, powdered dry food, and eventually baby brine shrimp. Sexual maturity is reached during the first year at a length of about 4 cm.

Distribution and Natural Habitat: This is one of five distinct subspecies of *Melanotaenia splendida.* It is mostly confined to Western Australia, but also ranges into the

western portion of the adjacent Northern Territory. The Western Australian populations inhabit two distinct regions, the Kimberley in the north and Pilbara in the central part of the state. The two areas are separated by desert with no permanent streams. The Ashburton River (Pilbara District) forms the southern limit of distribution in Western Australia. It is found in most drainages in the Northern Territory west of Darwin and few localities to the east including the South Alligator River system, Yirrkala, Groote Eylandt, and Bickerton Island. The latter two sites are in the western Gulf of Carpentaria. The habitat includes rivers, creeks, swamps, marshy lagoons, and lakes (both man-made and natural). It frequently forms aggregations at or near the surface of the deeper pools in stream habitats, especially where there is aquatic vegetation or log debris. It is often most abundant where water flow is minimal, for example in isolated rocky pools in a mostly dry streambed. In lake and swamp habitats it congregates around the shallow, sunlit margins, particularly where there is plenty of vegetative cover or submerged logs and branches. It sometimes co-occurs with other rainbowfishes, including *M. gracilis* in the Drysdale River, *M. exquisita* in the King George River, and *M. nigrans* in the Northern Territory.

Status: It was first collected from a stream in north-western Australia during the early 1870's by a minister named BOSTOCK. There is no precise date of its introduction to the aquarium hobby. I collected wild specimens and began keeping this fish in captivity in about 1974. Since that time it has been widely collected, mainly by visitors to the north-west and Darwin aquarists. Egg exchange programs are responsible for its introduction to the hobby in Europe and North America. It is perhaps the most abundant rainbow in Australia. Huge numbers inhabit the numerous rivers and creeks of northern Western Australia and much the Northern Territory. My wife and I once dragged a small seine through a 4-metre diameter pool in a dry riverbed in the South Alligator River drainage. With a single pass of the net we collected well over 500 fish (all of which were released).

Melanotaenia splendida australis



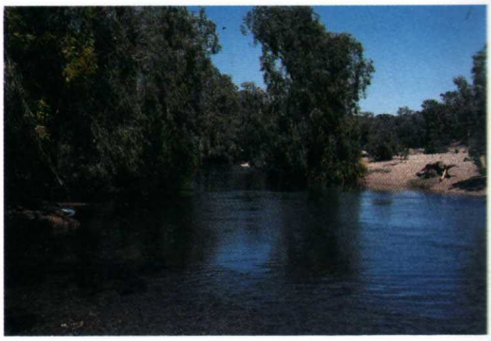
Chequered Rainbowfish

Melanotaenia splendida inornata

(CASTELNAU, 1875)

General features: A mainly stream-dwelling rainbowfish from far northern Australia, growing to about 12cm. The upper half of the body is blue to silver grey and the lower half is pinkish. There is a series of horizontal yellow to red stripes on the sides, one stripe between each scale row. Fin colour is highly variable, but the dorsal, anal, and caudal usually have a characteristic chequered pattern of black and yellow spots and streaks on a red, yellow, or blue background. This species has the longest, most attractive dorsal and anal fins of all the Australian rainbows. Older males develop a very deep body and humped forehead.

Aquarium care: This is an excellent aquarium fish with no special requirements. The recommended pH and temperature ranges are 6.0-7.0 and 25-28° C. It feeds on a significant amount of green algae in the natural environment. Therefore, it's a good idea to include vegetable matter in the diet. Duckweed *(Lemna minor),* an easy plant to



Habitat of *Melanotaenia splendida inorta,* Gregory River, Queensland

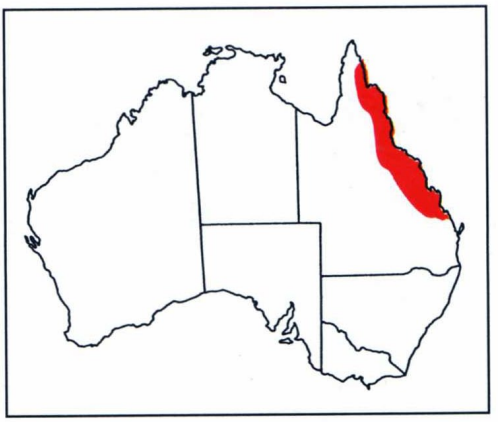
Melanotaenia splendida inorta

cultivate in outdoor ponds or tubs, is a perfect food. Besides the vegetable requirement, a diet of dry flakes supplemented with occasional frozen and live food should prove adequate.

Breeding: Identical to *M. spledida australis* (see above). It is a very prolific spawner. A large female will lay up to 100 eggs per week.

Distribution and Natural Habitat: It mainly inhabits river systems of the Northern Territory and Queensland flowing into the Gulf of Carpentaria, but also occurs in Arafura Sea drainages between the Mary River (75 kilometres east of Darwin) and western edge of the Gulf of Carpentaria. Habitat conditions are similar to that described above for *M. splendida australis*. It is sometimes found in turbid rivers, particularly on floodplains bordering the lower Gulf. However, it is also common in very clear streams over much of the range.

Status: It was first collected from a stream flowing into the Gulf of Carpentaria during the early 1870's, possibly by a man named STAIGER, who was the curator of the Brisbane Museum. There is no precise date of its introduction to the hobby, but it has long been familiar to Australian aquarists. It is also well established internationally. The species is very abundant in the wild throughout its geographic range.



Eastern Rainbowfish

Melanotaenia splendida splendida

(PETERS, 1866)

General features: A mainly stream-dwelling rainbowfish from north-eastern Australia, growing to about 14 cm. The colour is highly variable depending on geographic locality. Distinctive colour forms are often confined to individual creeks, rivers, or drainage systems. The ground colour is generally bluish or olive, grading to silvery white on the lower half. There is usually a mid-lateral dark stripe, but its intensity varies considerably. Most varieties have a narrow orange or reddish stripe between each horizontal scale row on the sides. Fins are variable, ranging from deep red or yellow to nearly plain. They are frequently spotted with shades of red, yellow, and black. Several geographical varieties are well established in the hobby. *Utchee Creek variety* - small in stature (to about 6 cm in the wild) with bluish back and prominent blue-black mid-lateral stripe. *Burdekin or Running River variety* - very deep body and zigzagging dark stripes on the lower sides. *Ravenshoe variety* - prominent mid-lateral stripe and bright red fins. *Wongabel variety* - overall mauve colouration. *Freshwater Creek variety* - large size and slender body (both sexes).

Aquarium care: It thrives in captivity. Groups of 10-20 fish in a separate aquarium make an interesting display, but it is also suitable for a community tank. A good quality flake food, supplemented with 2-3 feedings of live food and vegetable matter (duckweed is readily eaten) each week will keep your fish in good condition. Temperature and pH in the wild are incredibly variable: 20-29° C and 5.3-8.5 (usually 6.4-7.2).

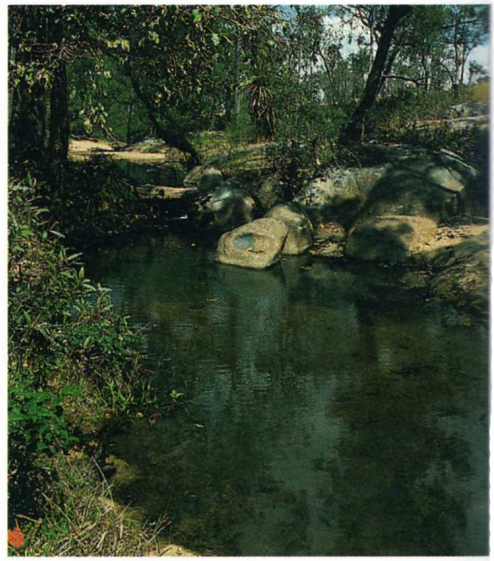
Breeding: Identical to *M. splendida australis* (see above). This is one of the few species for which there is detailed information concerning reproductive habits in the wild. Spawning occurs throughout the year, but there is a peak of activity during the rainy season (usually November to May). Spawning occurs among streamside vege-

Melanotaenia splendida splendida

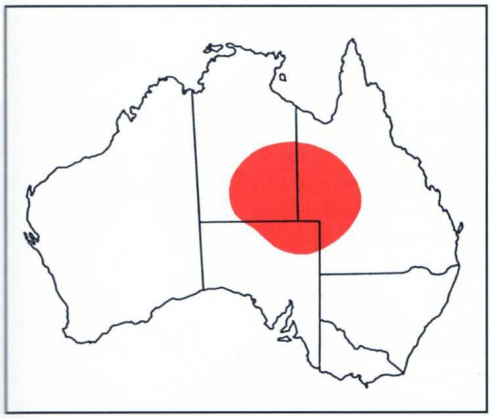
tation, mainly in the early morning. One to three eggs are deposited at a time and each female lays between 40-200 eggs during a 2-week period. The eggs measure about 1.5 mm in diameter and hatch in about seven days at 25-29° C. Newly hatched larvae range in length from 2.1 to 3.5 mm. They reach 3 cm after about 3 months and 5-6 cm by the end of the first year. Sexual maturation occurs when the fish are only about 4 cm long.

Distribution and Natural Habitat: It occurs in most river systems east of the Great Dividing Range in Queensland, Australia from Cape York Peninsula southward to the Boyne River near Gladstone. The habitat mainly consists of small streams, but it is also present in lakes and reservoirs. Aggregations are usually seen near the surface of deeper pools in stream habitats. The young prefer grassy banks and log debris. Water clarity is variable, but usually clear except during floods. Streams are often well vegetated, but plants are sometimes lacking, particularly in rocky creeks flowing through dense rainforest. It is sometimes found in the same streams with *M. maccullochi, M. trifasciatus, Cairnsichthys rhombosomoides, Pseudomugil gertrudae*, and *P. signifer*.

Status: It was first captured by an unknown collector in the mid-1800's from a stream near Rockhampton, Queensland. The fish has been in the hobby for many years in Australia. It is also available in Europe and North America. Wild populations are abundant throughout the geographic range in eastern Queensland.



Habitat of *Melanotaenia splendida splendida*, Hervey's Range, North Queensland



Habitat of *Melanotaenia splendida tatei*, Finke River, South Australia

Desert Rainbowfish

Melanotaenia splendida tatei

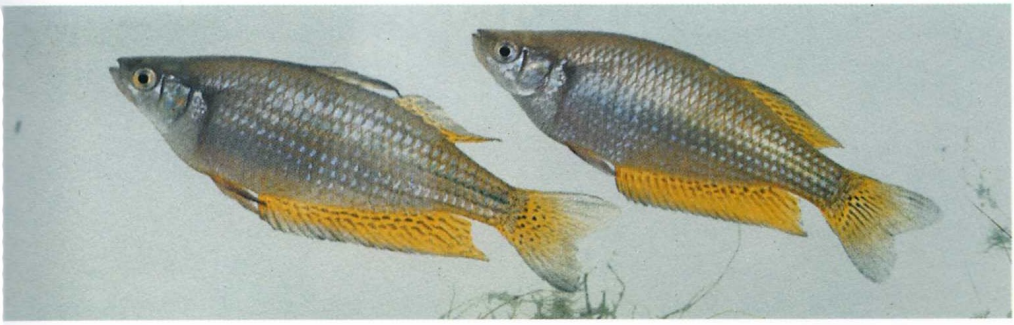
(ZIETZ, 1896)

General features: A mainly stream-dwelling rainbowfish from central Australia, growing to about 10 cm. The colour is overall silvery with a narrow copper-hued stripe between each scale row on the sides. The dorsal, anal, and caudal fins are spotted with brown, mainly on the lower half.

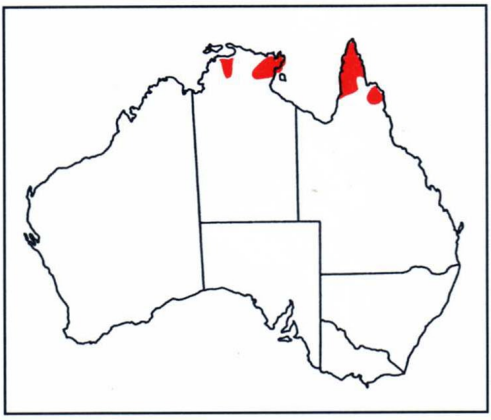
Aquarium care and Breeding: No information, but probably similar to other subspecies of *M. splendida.*

Distribution and Natural Habitat: It inhabits the central Australian desert, which includes parts of the Northern Territory, South Australia, Queensland, and New South Wales. Most of the distribution encompasses streams that flow into the Lake Eyre Basin, including the following drainage systems: Georgina River, Diamantina River, Cooper Creek, Lake Frome, and Finke River. It also occurs on the Barkly Tableland and in Lake Woods, both in the central-eastern section of the Northern Territory. The habitat consists of semi-permanent streams, springs, artesian bores, and reservoirs. Many of the streams flow only during flood periods. During prolonged droughts the fish are confined to isolated pools in rocky gorges.

Status: This subspecies was first collected in the Finke River in the 1890's. Apparently it has rarely been maintained in captivity. Only a few Australians, mainly those who have collected their own stock, have kept it. I doubt if it will ever become popular due to the subdued colouration in comparison with other subspecies of *M. splendida.* It is abundant in the natural habitat.



Melanotaenia splendida tatei



Banded Rainbowfish

Melanotaenia trifasciata

(RENDAHL, 1922)

General features: A mainly stream-dwelling rainbowfish from northern Australia, growing to about 13 cm. The species is renowned for its many geographic colour varieties. Specimens from most areas have a prominent mid-lateral stripe that ranges from deep blue to blackish. The colour of the upper half of the body is usually shades of blue, purple, red, green, or yellow. The dorsal, anal, and caudal fins are frequently red or yellow. Here is a listing of some of the more popular geographic varieties and their salient features: *Goyder River* (No. Territory) - vivid mid-lateral stripe and deep red fins; *Giddy River* (No. Territory) - blue back and crimson fins; *Alligator River* (No. Territory) - mauve upper body; *Coen River* (Cape York Peninsula) - green body and reddish fins; *Weipa* (Cape York Peninsula) - yellow body (reminiscent of *M. herbertaxelrodi* from New Guinea); *Iron Range and other Pacific drainage streams* (Cape York Peninsula) relatively slender body that is shades of blue. Older males from most localities develop a very deep body and humped forehead. Sex differences are not as apparent in this species, but males have a longer first dorsal fin, which overlaps the beginning of the second dorsal when it is laid back.

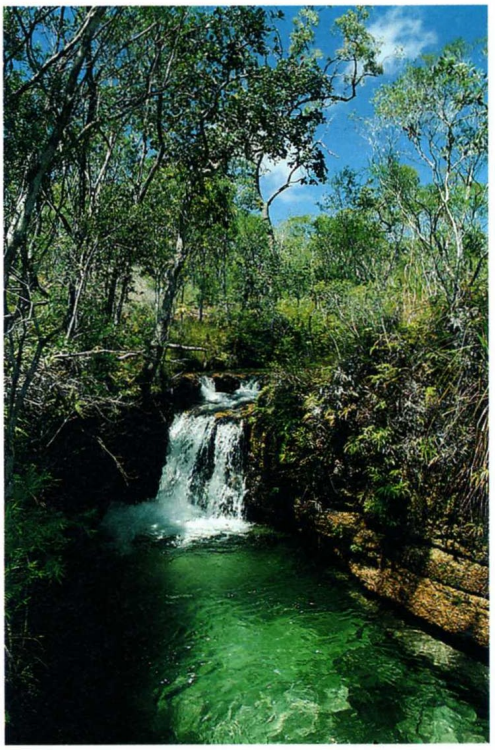
Aquarium care: An excellent aquarium fish. For sheer beauty this species is hard to beat. It is suitable for community tanks with other

Melanotaenia trifasciata

rainbows or makes a dazzling display on its own. A tank size of at least 50-60 litres is recommended for a trio of adults. Natural waters range in pH between 5.2-7.0, but they can be maintained and will breed in slightly alkaline conditions. An article by Craig NEWHOUSE in *Rainbow Times* (published in the US by the Rainbow Fish Study Group) states that colours are greatly enhanced if the fish are maintained at pH 6.5 with water hardness between 100 and 150 ppm. Dark gravel and dense plant growth will also help to maximise the fish's colouration. Proper lighting will contribute as well. The combination of sunlight (1-2 hours in the early morning) and Gro-Lux bulbs will show the colours with maximum effect. Feeding is never a problem. Be sure and include occasional live (mosquito larvae and brine shrimp for example) and green foods.

Breeding: I usually breed this fish in trios that includes a pair of females. It is a prolific spawner; a pair of well-conditioned females will produce up to 50-60 eggs daily. I prefer to use Java moss as a spawning medium, but floating mops are just as good or better. Eggs should be removed every 2-3 days and placed in a separate hatching container. I generally use a small amount of methylene blue to discourage egg fungus. Hatching occurs in about one week at 26-27° C. Infusoria, Liquifry, and powdered foods can be fed initially, followed in 1-2 weeks by newly hatched brine shrimp and microworms.

Distribution and Natural Habitat: Occurs in the Northern Territory and Cape York Peninsula. The distribution in the Northern territory extends from Melville Island (north of Darwin) and the Mary River (about 100 kilometres east of Darwin) eastward to the rivers of Arnhem Land and Groote Eylandt in the Gulf of Carpentaria. The Cape York distribution includes most streams on the western side of the Cape north of the Archer River and down the eastern side to the vicinity of Iron Range. There is also an apparently isolated population further to the south at the McIvor River (40 kilometres north of Cooktown). A variety of habitats are encountered, ranging from semi-rainforest to more open savanna country with an



Habitat of *Melanotaenia trifasciata*, Sam Creek, Cape York Peninsula

abundance of paperbarks and *Eucalyptus* trees along the banks. Occasionally it is abundant in partly stagnant waterholes with leaf litter bottoms during the dry season. It is most often found in small creeks and waterholes in clear to moderately turbid conditions. Streams are often rocky or have gravel bottoms, but it is also found in well vegetated areas. Fish may congregate around submerged logs and branches. Other rainbows and blue-eyes occurring in the same streams include *M. maccullochi, M. splendida inornata, Iriatherina werneri,* and *Pseudomugil gertrudae.*

Status: It was first collected in June 1895 by the Norwegian zoologist Knut DAHL in the Mary River, Northern Territory. It has long been a favourite of Australian aquarists, and is also popular in Europe, America, and Japan. The species is abundant in the natural habitat in both the Northern Territory and on Cape York Peninsula.

Ornate Rainbowfish

Rhadinocentrus ornatus

REGAN, 1914

General features: A stream and pond-dwelling rainbowfish from south-eastern Queensland, growing to about 5-6 cm. The body is semi-transparent with dark scale margins forming a network on the body. There is often a pair of dark stripes, one on each side of the mid-lateral scale row. Iridescent neon blue spangles are apparent on the back and nape under good lighting conditions. The overall body is sometimes suffused with shades of pink, blue, or red. The colourful fins are perhaps the most beautiful feature. The dorsal, anal, caudal, and pelvic fins are generally reddish, frequently with blackish rays. Fish from the vicinity of Tin Can Bay and Fraser Island have beautiful sky blue to purple fins. Fish from dark, tannin-stained waters, such as Coolum Creek and tributaries of the upper Noosa River, are very dark, nearly black, on the body and fins.

Aquarium care: This is a small, delicate-looking rainbow, but nevertheless does well in captivity. It is not suitable for a community tank, although they can be kept with small blue-eyes. A tank of at least 30-40 litres is recommended for a group of 5-6 fish. It will eat most standard fish foods, but it is important to supplement the diet with live items such as mosquito larvae, *Daphnia*, and brine shrimp. The best colours are displayed if the water is stained to the consistency of weak tea. This can be achieved by adding a commercially prepared blackwater extract.

Breeding: It spawns readily in captivity, but sometimes initial problems may be encountered. These are usually due to improper water conditions, incompatible fish, or poor conditioning. It is important to use well-filtered aged water. Most breeders use very soft, acidic water, total hardness 5-80 ppm and pH 6.0-6.8. I have had good luck when the water level is lowered to a depth of about 20-30 cm and the tank

Rhadinocentrus ornatus

is located where it receives 1-2 hours of early morning sunlight. Spawning can sometimes be induced by either adding a small quantity of epsom salts (1.0 grams per 10 litres of water) or by adding fresh rainwater (increasing the contents by about 30 percent). If this is beginning to sound like a difficult fish, it's not true! I recently set up a group of five fish (including three females) in a 40 litre tank with pH of 7.5 (same as our tapwater). I did not really intend to breed the fish, but an ample supply of Java moss was provided. After about two weeks I noticed a few small fry swimming amongst the Java moss, near the surface. Five survived and they are now about a third the size of the adults, after only 60 days. I did not have any live starter foods available and the fry were raised exclusively on TetraMin "E" powdered dry food for egg layers. It doesn't get much easier than that! However, the best results are achieved with initial feedings of infusoria in combination with powdered food, followed in 1-2 weeks by newly hatched brine shrimp and microworms. Also, a higher yield will result if the eggs or parents are removed to a separate tank. Floating mops work just as well for a spawning medium. The incubation period is 6-10 days at 23-28° C.

Distribution and Natural Habitat: Distributed in south-eastern Queensland and adjacent northern New South Wales. It is found in coastal area east of the Great Dividing Range between about Coffs Harbour, New South Wales and Rockhampton, Queensland, a distance of about 850 kilometres. Fraser Island was formerly believed to be the northern limit of distribution, but ANGFA member Jonathan MARSHALL collected it in Waterpark Creek, approximately 60 kilometres north of Rockhampton, in July 1985. This discovery represents a significant northward range extension of about 320 kilometres. The habitat is situated in sand-soil country (locally known as Wallum), near the coast. It consists of slow-flowing, often tea-stained, creeks and backwaters or ponds, and dune lakes. In larger rivers, it is restricted to the unpolluted, upper tributaries. The pH and temperature ranges from 5.0-6.8 and 20-28° C. The fish are found among submerged logs and branches or along grassy banks, often among reeds or water lilies. It is sometimes found living with *Pseudomugil mellis*, *P. signifer*, and *Melanotaenia duboulayi*.

Status: First described by REGAN in 1914 on the basis of six specimens collected from a pond on Morton Island near Brisbane. It has been popular with Australian native fish enthusiasts for many decades and more recently has become available in Europe and America. It is more of a specialist fish that needs extra attention to details in order to show its full potential. But it is definitely worthwhile. The species is still holding its own in the wild, but pollution, dam construction, housing developments and land clearing have negatively impacted the environment in several areas. Further collecting is needed to determine if the distribution is more or less continuous between Fraser Island and the recently discovered population north of Rockhampton.

Habitat of *Rhadinocentrus ornatus*, Dunelake near Noosa, South Queensland

RAINBOWFISHES OF NEW GUINEA

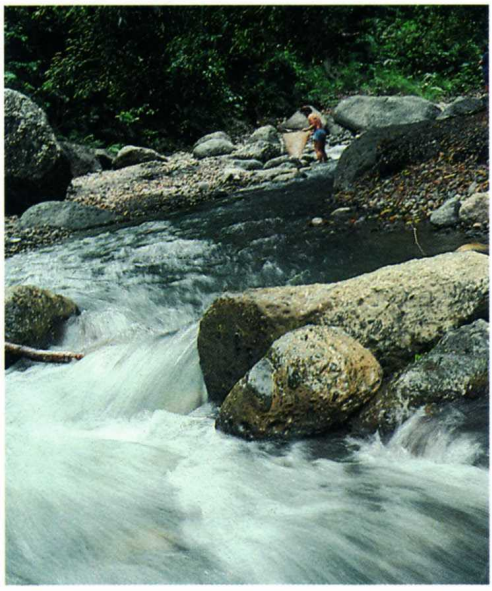
Introducing New Guinea rainbows

New Guinea is a land of exciting discovery and endless surprises. There is no other place on earth I would rather visit. For a biologist it is paradise on earth! I already had a strong affection for the place, long before I discovered the world of rainbowfishes. I made several trips there in connection with my work on coral reef fishes. Since the first visit in 1972 I have been back 16 times. Each trip seems to surpass the previous one as far as biological discoveries are concerned. Even for the non-biologist, the world's second largest island (after Greenland) is a real eye opener. It is one of the few tropical lands on earth that still have huge tracts of unexplored territory.

It is impossible to visit without being impressed by its incredible diversity of landscapes, wildlife, and cultures. The alpine-like central mountains rise to an elevation of 5000 m. I was once caught in a raging snowstorm while climbing Mt. Wilhelm, Papua New Guinea's tallest peak. The mountains form an impenetrable tangle of limestone cliffs and saw-toothed ridges. Torrential rivers cut spectacular, narrow gorges that are nearly one thousand metres deep. New Guinea has the highest percentage of virgin rainforest of any place on earth. It is also one of the wettest places with an annual rainfall of up to 10 metres in some spots.

A total of 43 rainbow species have been recorded thus far. The island's fish fauna is still inadequately surveyed, particularly Irian Jaya, which occupies the western half. It is conservatively estimated that at least another 10-15 rainbows will be discovered in the next few years.

New Guinea is the perfect environment for rainbow evolution. It is geologically youthful, contains a variety of land forms,



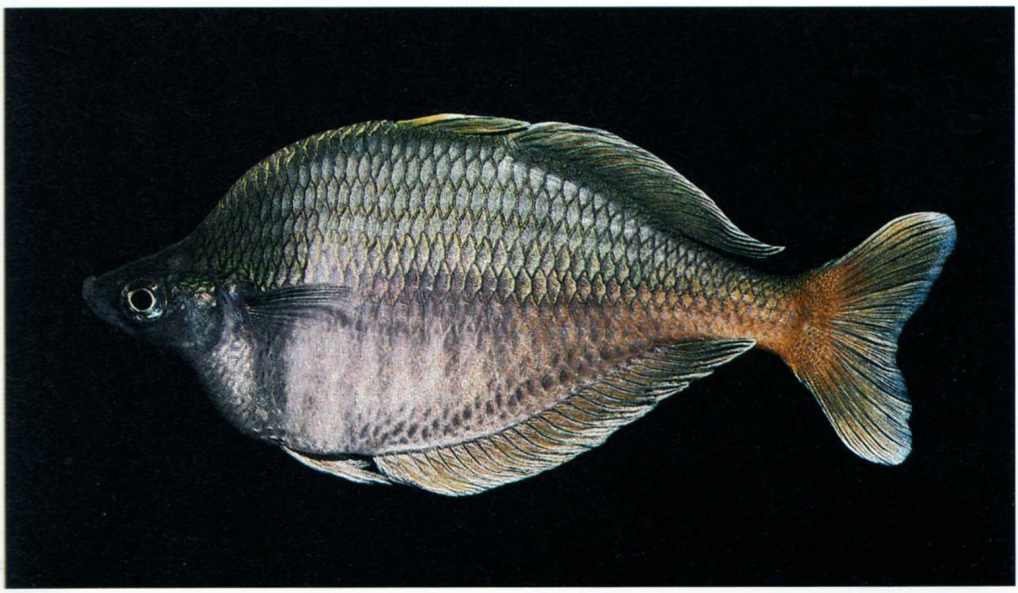
Habitat of *Chilatherina bulolo*, Erap River, Papua New Guinea

Habitat of *Melanotaenia affinis*, Bluewater Creek near Madang

and has a huge rainfall resulting in extensive aquatic habitats. Mountains throughout the island form effective barriers that have isolated rainbow populations, thus aiding the speciation process. Landslides, volcanism, and various other geological phenomena have contributed to this process.

The high central mountains have formed a particularly effective isolating mechanism. There is a very distinctive rainbow fauna on each side of the central range. Only *Chilatherina campsi* is found on both sides of the divide. The northern fauna includes 20 species belonging to three genera. Two of the genera, *Glossolepis* and *Chilatherina*, are unique to this region. South of the dividing range, 13 species of rainbows are found, all in the genus *Melanotaenia*, except for *Iriatherina werneri*. Three species, including *I. werneri, M. macullochi* and *M. splendida* are shared with Australia. Their distribution reflects the very recent connection of Australia and southern New Guinea, which have been joined through much of the geologic past. The water barrier which is now the Arafura Sea, Gulf of Carpentaria, and Torres Strait is a relatively recent phenomenon. It resulted from rising sea levels after the last major glacial epoch (Pleistocene). These seas are very shallow, with average maximum depths of about 15-60 m. During much of the Pleistocene glacial period this area formed a lowland alluvial plain with numerous rivers and swamps. The Torres Strait land connection persisted until about 7,000 years ago.

The Vogelkop or Birdshead Peninsula and adjacent islands of Waigeo, Batanta, Salawati, and Misool, is a third centre of rainbowfish speciation. This region includes the extreme western end of the mainland, which is essentially isolated by a narrow mountainous isthmus. It is divided into the main Vogelkop Peninsula and the smaller Bomberai Peninsula that lie north and south respectively of the intervening Bintuni Bay. The region consists of lowland forest with large tracts of heavily corrugated karst topography. There are also mountains in excess of 2,000 m along the north coast of the Vogelkop Peninsula and the north-western corner of the Bomberai Peninsula. Ichthyologically the region is still poorly explored, but nine species of rainbows, all in the genus *Melanotaenia*, have already been found there.

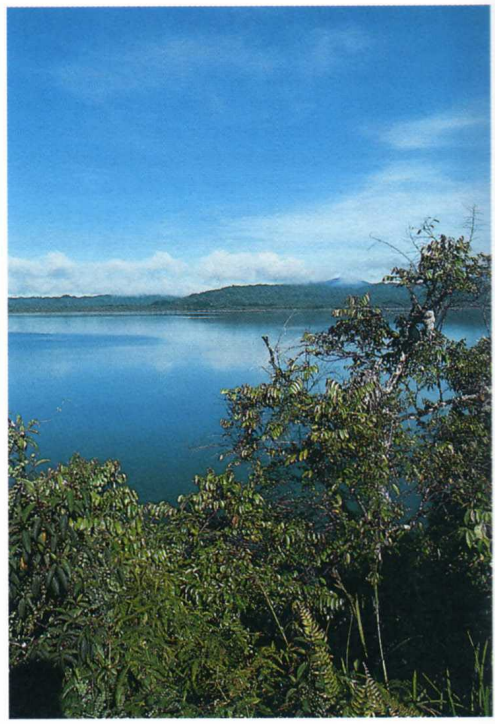


Chilatherina bleheri

New Discoveries

One of the most exciting aspects of exploring New Guinea's aquatic environments is the discovery of previously uncollected rainbows. It's a near certainty that any trip to unexplored territory will result in species that are new to science. For example, I recently participated in a WWF-sponsored expedition to the Kikori River of Papua New Guinea. The Kikori system includes well known Lake Kutubu, but the rest of the drainage is poorly explored. As expected, I collected the two wide-ranging species, *Melanotaenia goldiei* and *M. splendida rubrostriata* from lowland tributaries. I was delighted to discover an additional pair of beautiful new rainbow species that I plan to describe in the near future. A visit to Irian Jaya in 1991 also yielded several new rainbows, which are still awaiting formal description.

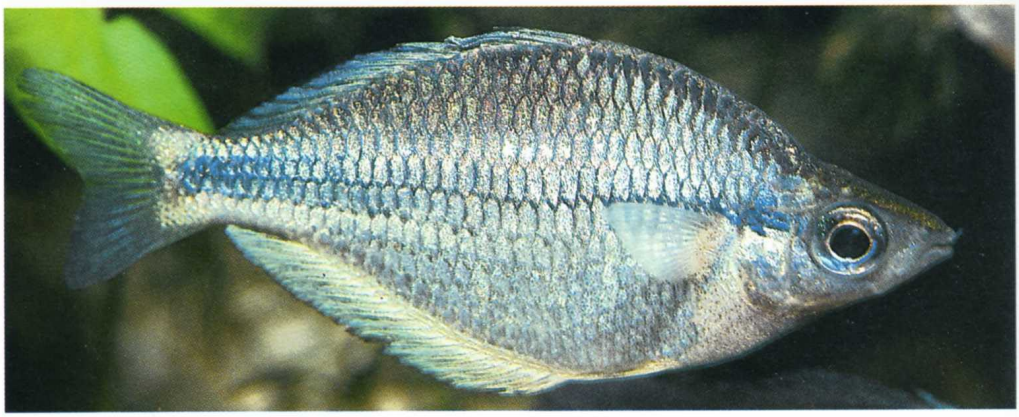
Here's a capsule summary of the recent discoveries that are yet to receive their official scientific names. Of course none of these species are available in the hobby, but hopefully their introduction is not far away.



Habitat of *Melanotaenia lacustris*, Lake Kutubu, Papua New Guinea

Kamaka Rainbowfish
Melanotaenia sp.

Inhabits LakeKamaka, the largest of three main lakes and several smaller ones just inland from Triton Bay, Irian Jaya. This area is situated on the southern coast of the isthmus connecting the main part of New Guinea with the Fak Fak or Bomberai Peninsula. It is similar in shape and general habits to the Lake Kutubu Rainbowfish.



***Melanotaenia* sp. from Lake Kamaka**

***Melanotaenia* sp. from Siriwo River**

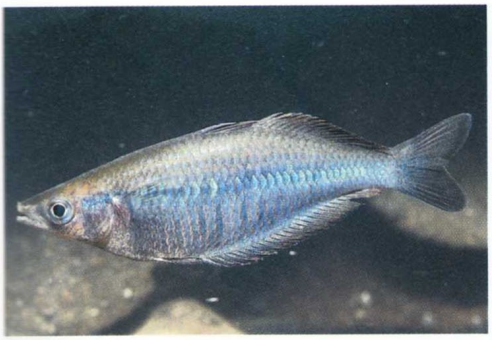
Siriwo Rainbowfish
Melanotaenia sp.

Inhabits the Upper Siriwo River in mountainous terrain of central Irian Jaya. This is a northern drainage that flows into Cenderawasih Bay. It is a relatively slender fish, which judging from the reports of aquarists in Irian Jaya is well suited for captivity.

***Melanotaenia* sp. from Kikori River system**

Kikori Blue Rainbowfish
Melanotaenia sp.

Inhabit both lowland and mountainous creeks and swamps to an altitude of about 500 metres. Known only from the Kikori River system of Papua New Guinea. It's a small (to about 6 cm), brightly coloured rainbow that is bound to be popular when it is everntually introduced to the aquarium hobby.



***Chilatherina* sp. from Yapen Island**

Azure Rainbowfish
Chilatherina sp.

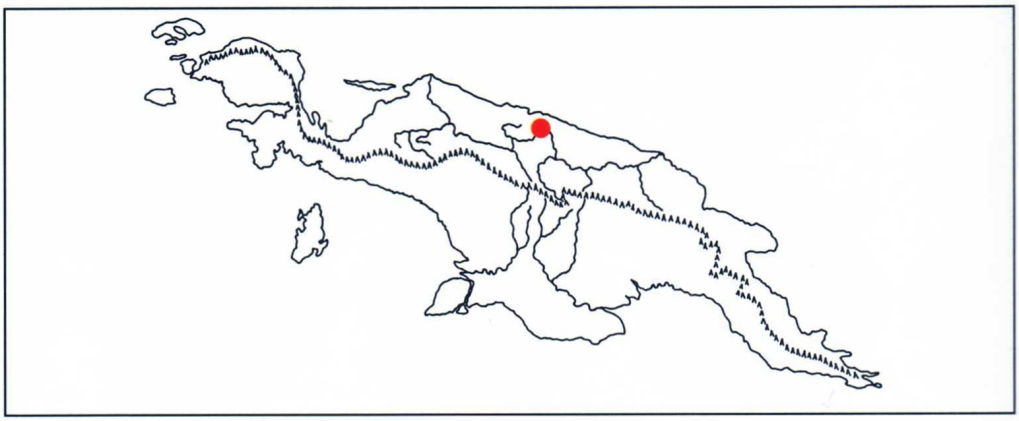
Inhabits creeks and rivers of Yapen Island, northern Irian Jaya. Found in the same streams with *Melanotaenia japenensis.* It's a beautiful blue-hued species, similar in general appearance to *Chilatherina fasciata.* There is a possibility it may be just a colour variation of *C. fasciata*

***Melanotaenia* sp. from Kikori River system**

Turquoise Rainbowfish
Chilatherina sp.

Inhabits creeks and rivers in hilly and mountainous terrain of the Upper Kikori River system, Papua New Guinea. It is most abundant at moderate elevations, ranging between 400-800 m. Adult males develop a very deep body and are similar in appearance to the Lake Kutubu Rainbowfish.

Species Section



Axelrods Rainbowfish
Chilatherina axelrodi
ALLEN, 1980

General features: A stream-dwelling rainbowfish from north-western Papua New Guinea, growing to a size of about 10-11 cm. Males are grey on the upper back and whitish on the lower half. There is a blackish mid-lateral stripe that is broken

Chilatherina axelrodi

into a series of large blotches, and also several dark vertical bars on the lower side. The anal and pelvic fins are yellow.

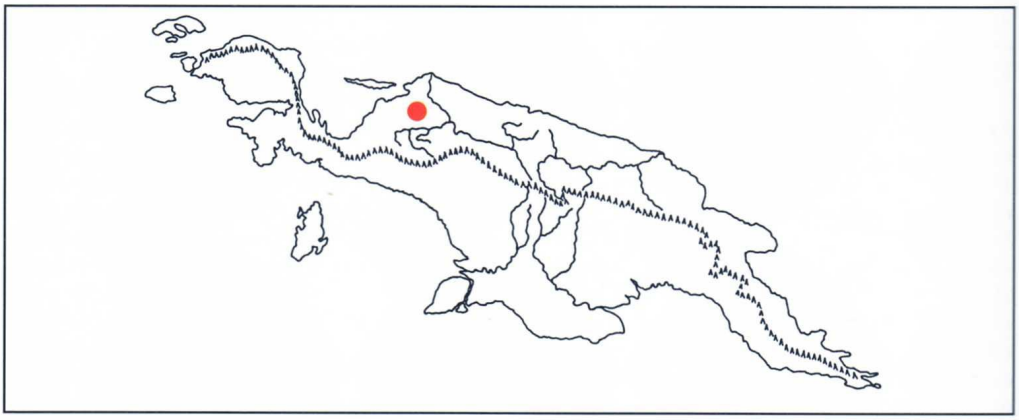
Aquarium care: It is an easy species to keep in captivity. A tank size of at least 150 litres is recommended as it thrives in non-crowded conditions. Temperatures of 24-27° C and pH range of 7.5-7.8 will simulate the natural conditions. Hardness is not critical, at least for adults. The best colouration is achieved if the tank is exposed to 1-3 hours of natural sunlight each day and there is plentiful vegetation. Tank reared specimens may live at least 5 years. It is suitable for community tanks that contain other similar-sized rainbows. It eats a wide range of dried, frozen, and live foods. Green foods are essential as much of the natural diet consists of filamentous algae.

Breeding: This species spawns readily if mops or a mat of Java moss is provided. Spawning usually occurs early in the morning. Each female may deposit as many as 20-30 eggs daily. The eggs should be removed and placed in a separate nursery tank soon after spawning as the adults are voracious egg eaters. The one-millimetre diameter eggs hatch in about 10-12 days at 26° C. The fry may be difficult to raise. Hard, alkaline, and well filtered water is recommended. The addition of shell grit will improve the survival rate of the fry. Initial feedings should consist of egg yolk, Liquifry, infusoria, and microworms.

Distribution and Natural Habitat: This species was first discovered by the author in 1979. About 50 fish were collected from a tributary of the Nemayer or Pual River in the Bewani Mountains of Papua New Guinea. This locality is approximately 40 kilometres inland from the north coast town of Vanimo, which is close to the Irian Jaya border. The species was abundant in a narrow (3 m), slow-flowing stream in 1.5 m-deep pools. Although situated in rainforest, the stream bed was relatively well-exposed to sunlight. The water was slightly turbid and a temperature of 25.8° C and pH 7.8 were recorded. Other rainbows found in this stream included *Chilatherina crassispinosa* and *Melanotaenia affinis.*

Status: Live wild-captured fish were brought to Australia by the author in 1979 and Heiko BLEHER imported specimens to Germany in 1982. In spite of its very attractive appearance and good adaptability to aquarium conditions, it has never achieved much popularity in the hobby. Captive stocks are low at present and there is a need for additional wild-captured fish to insure the long-range viability of this species in the aquarium hobby. The distributional limits of this species are unknown. Additional surveys are needed in the Bewani Mountains and surrounding areas. Thus far it is known only from a single small creek.

Habitat of *Chilatherina axelrodi*, near Bewani, Papua New Guinea



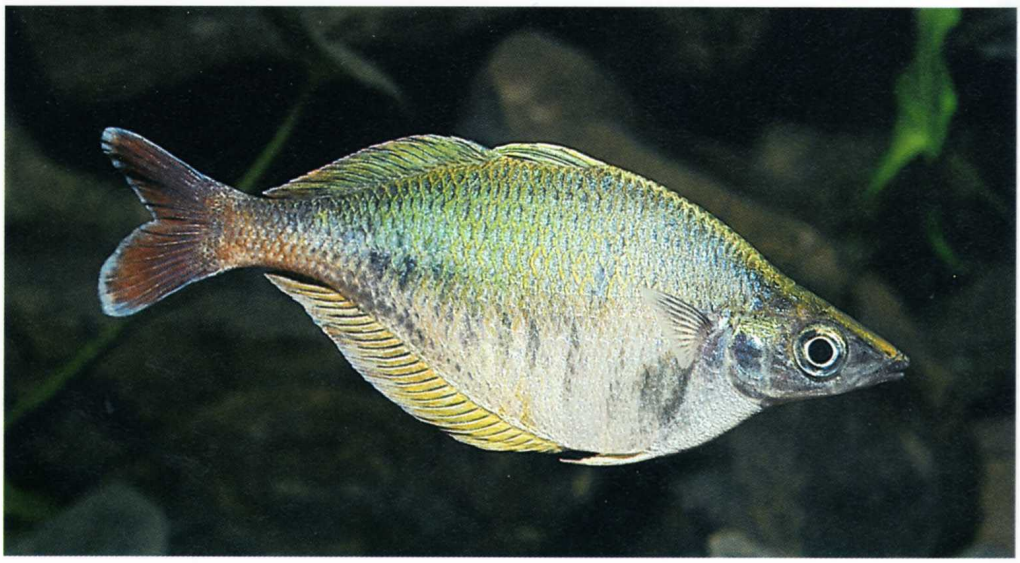
Bleher's Rainbowfish

Chilatherina bleheri

ALLEN, 1985

General features: A stream and lake-dwelling rainbowfish, from the Mamberamo region of Irian Jaya, growing to a length of at least 13 cm. Adult males are generally white or greyish anteriorly, becoming reddish on the posterior part of the body and on the tail. The scales on the anterior half of the body have a lime-green margin. There is usually a series of faint dusky bars on the lower side. The dorsal and anal fins range from yellow to reddish. Older males develop a tremendously deep body.

Aquarium care: This species does well in aquarium conditions, and tolerates a wide range of temperature and pH (25-28° C and 7.5-8.0 are recommended). I successfully kept a group of 12 fish in a 350 litre tank for more than six years. The species should be suitable for a community tank containing similar-sized rainbows or other peaceful fishes.



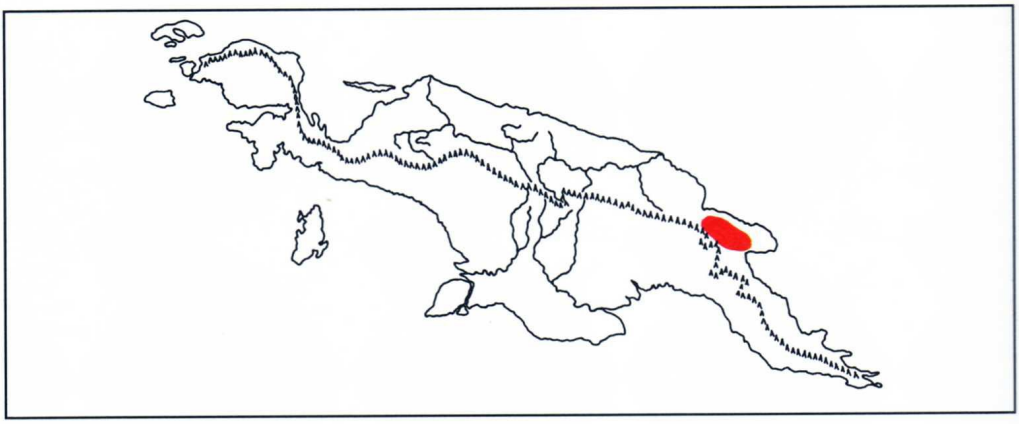
Chilatherina bleheri

Breeding: It spawns readily when supplied with either mops or Java moss. Males becomes sexually mature at a length of about 6 cm and females are slightly smaller. Males announce their readiness to spawn by repeatedly flashing a brilliant yellow-orange stripe on the middle of the forehead. They sometimes become aggressive towards prospective mates at this time. It is therefore advisable to have 2-3 females for every male, in order to dilute these tendencies. The adults usually eat the eggs and fry, so the eggs should be transferred to a separate hatching container. The care of the young is similar to that recommended for other rainbows.

Distribution and Natural Habitat: It is known only from Danau Bira (Lake Holmes) in the lower Mamberamo system of Irian Jaya. The locality consists of three interconnected lakes. The largest is approximately 4.5 kilometres long and 2 kilometres wide. The lakes are situated in hilly jungle terrain and lie at an elevation of 430 m above sea level. The depth appears to be relatively shallow (perhaps averaging less than 5-10 m) and dead tree stumps, which protrude above the surface are a prominent feature. Their presence indicates that the present shoreline or perhaps the entire lake system was formed in recent time, perhaps the past 100 years, by a catastrophic event, which blocked the feeder stream. The lakes are presently drained by a small stream that flows into the Mamberamo River about 15 kilometres to the north. The fish is abundant along the heavily vegetated shoreline, and also in small, rocky tributary streams. It is the only rainbowfish present in these habitats. *Melanotaenia maylandi* is found in a nearby stream, but the two species have never been found together.

Status: This fish was discovered by Heiko BLEHER and the author during a visit to Irian Jaya in 1982. Mr. BLEHER succeeded in transporting live specimens to Germany as a result of this trip. It is now well established in the hobby and one of the most popular species. I last visited the natural habitat at Danau Bira in 1991. The fish is still very abundant despite growing populations of the introduced African Tilapia *(Oreochromis mossambicus)* and a species of barb.

Habitat of *Chilatherina bleheri*, Lake Holmes, Irian Jaya



Bulolo Rainbowfish

Chilatherina bulolo

(WHITLEY, 1938)

General features: A stream-dwelling rainbowfish from north-eastern Papua New Guinea, growing to a size of about 8.5 cm. Adults are overall silvery with a black streak on the upper and lower edges of the caudal fin.

Aquarium care: One of the more difficult rainbows to maintain in captivity. It seems to gradually lose condition and does not survive very long. Probably more consideration of its natural habitat is necessary. This means providing ample rock for shelter, heavy aeration, and a temperature and pH range of 22-26° C and 8.0-8.8.

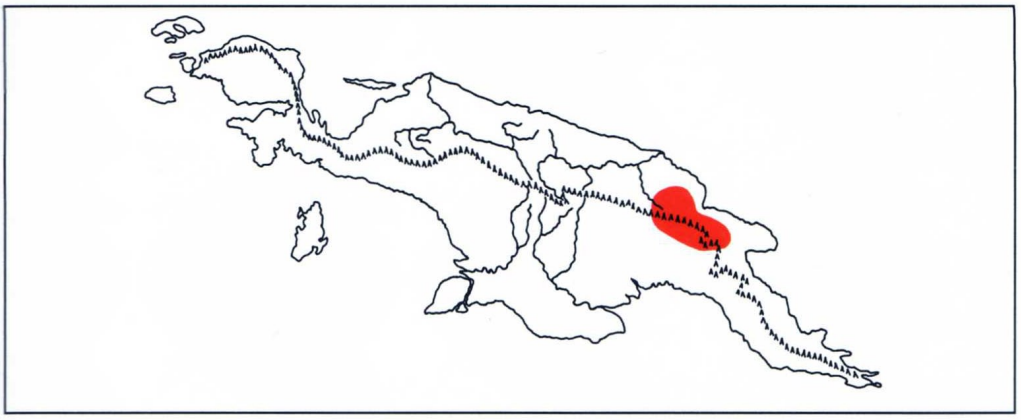
Breeding: No information.

Distribution and Natural Habitat: Known from a few scattered localities in the Markham and Ramu river systems of north-eastern Papua New Guinea. I have collected it in the Erap, Snake, and Bulolo rivers (Markham system) and the Whege River (Ramu system). These are foothill or mountain streams with rapid flow and coarse gravel or cobble bottoms. The fish often occurs in "white water" rapids, an unusual habitat for rainbowfishes.

Chilatherina bulolo

Status: The first specimen was collected in the Bulolo Valley by F. B. HILSOP in 1934. It was not seen again until Brian PARKINSON and I obtained both live and preserved specimens in 1978 at the Erap River near Lae. I transported a few aquarium fish back to Australia, but they only survived for a few months. It has never become established in the hobby. It would only be of interest to advanced rainbow hobbyists due to its drab appearance and difficult maintenance. Although more surveys are required, it appears to be abundant in the natural habitat.

Habitat of *Chilatherina bulolo*, Whege River, Ramu Valley



Highlands Rainbowfish
Chilatherina campsi
(WHITLEY, 1956)

General features: A stream-dwelling rainbowfish from northern and central Papua New Guinea, growing to a size of about 8-9 cm. Males are olive to mauve on the

***Chilatherina campsi* - Female**

***Chilatherina campsi* - Male**

back with silvery reflections on the scales and whitish on the lower half with a bluish-black mid-lateral stripe.

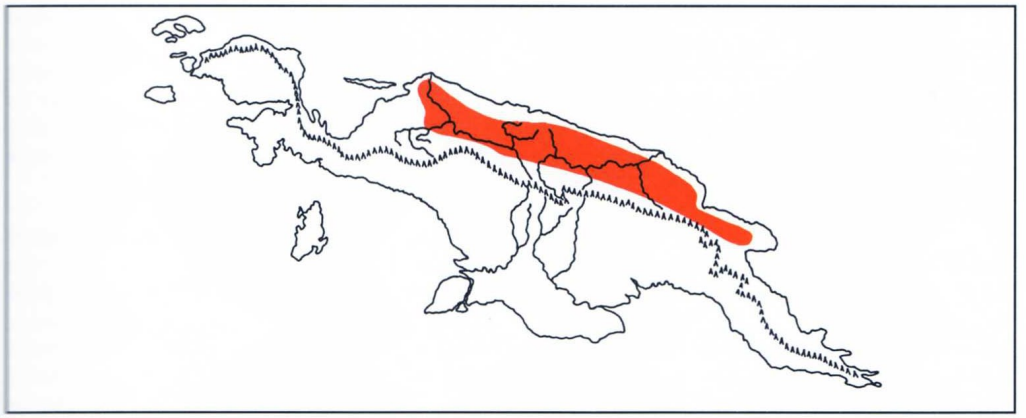
Aquarium care: An easy species to keep in captivity, either by itself or in a community aquarium. It readily accepts all standard foods, but regular offerings of live food are necessary for optimum coloration and prime breeding condition. It tolerates a wide range of temperature and pH, but does best in the range of 23-25° C and 7.0-7.5.

Breeding: It spawns readily in both mops and Java moss. Spawning usually occurs early in the morning. Each female may deposit as many as 20-30 eggs daily. The eggs should be removed and placed in a separate nursery tank soon after spawning. The eggs hatch in about 10-12 days at 25-26° C. Initial feedings should consist of powdered dry food, egg yolk, Liquifry, infusoria, and microworms. The young become sexually mature in about six months.

Distribution and Natural Habitat: This species has the distinction of being the only New Guinea rainbowfish that is found in both northern and southern drainage systems. It is most common in northern systems, occurring in the Markham, Ramu, and Sepik river drainages. The Upper Purari River is the only southern system reported thus far. The habitat consists of clear, moderately fast to swift-flowing streams situated mainly in hilly or mountainous terrain between about 200 and 1525 m above sea level. However, on one occasion I collected it from a rainforest stream flowing through flat terrain in the middle Ramu River valley at an elevation of only 80 m. It is most common in deeper pools or in sections with reduced flow such as side branches and backwaters.

Status: It was first collected in 1954 in a tributary of the Jimmi River (Sepik system) by E. TROUGHTON. It was not seen again until 1979 when it was collected by Brian PARKINSON and the author in the Wahgi River (Purari system) near Mt. Hagen. I brought a few live specimens back to Australia. Further live collections were obtained from the Lae area and near Mt. Hagen by Barry CROCKFORD in 1980-81. Others were collected by Heiko BLEHER from a tributary of the Middle Ramu River in 1988. These collections over a 10 year period formed the nucleus of current aquarium stocks. It is popular with rainbowfish specialists, but is not well known in the general aquarium hobby. The species appears to be abundant in the natural habitat, although it is known only from widely scattered localities.

Habitat of *Chilatherina campsi*, Pima River, Papua New Guinea



Silver Rainbowfish

Chilatherina crassispinosa

(WEBER, 1913)

General features: A stream-dwelling rainbowfish from northern New Guinea, growing to a size of about 13 cm. Adults are overall silvery with a faint black streak on the upper and lower edges of the caudal fin. Males have narrow orange stripes on the side, one between each scale row, and the dorsal and anal fins are pale yellow. It is similar in general appearance to *C. bulolo*, but has a more pointed snout, taller first dorsal fin, and has a narrower space on top of the head between the eyes.

Aquarium care: It is better suited for captivity than the similar *C. bulolo*. In nature it feeds on small insects, particularly ants,

Chilatherina crassispinosa

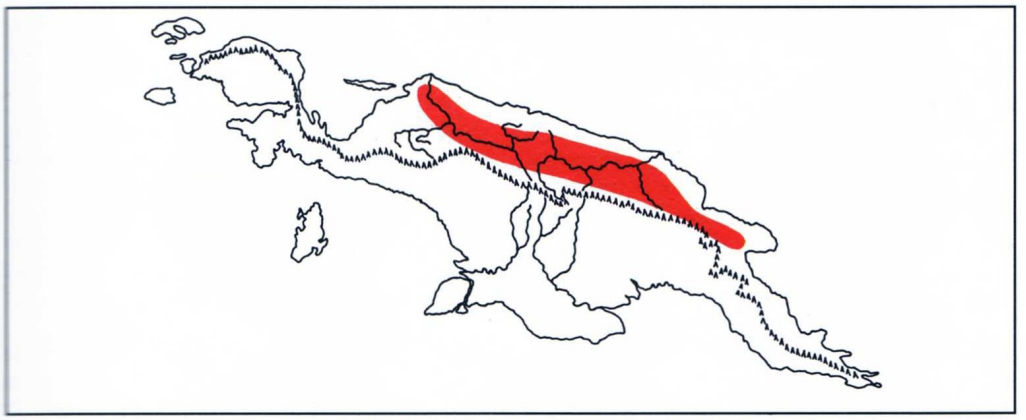
and filamentous algae that is grazed from rocks. Captive specimens will thrive on a diet of dry flake food (TetraMin), and occasional feedings of mosquito larvae and other live foods. Recommended temperature and pH are 24-28° C and 7.5-8.0, which are the same ranges found in the natural habitat.

Breeding: No information, but should be similar to most other rainbows.

Distribution and Natural Habitat: It is widely distributed in northern Papua New Guinea and Irian Jaya. Proceeding from east to west it is found in the following river systems: Markham, Gogol, Ramu, Sepik, Pual, and Mamberamo. It also occurs in many smaller independent drainages along the north coast. The habitat is usually in hilly or mountainous terrain at elevations between 100-600 m. Streams are typically in rainforest habitat with clear water and rock, gravel, or sandy bottoms. The fish congregate in exposed sections, which receive full sunlight for most of the day. The streams are frequently inhabited by other rainbows including *C. lorentzi*, *C. fasciatus*, and *M. affinis*.

Status: It was first collected by the Dutch North New Guinea Expedition in the Tawarin River, Irian Jaya during June 1903. The first live aquarium specimens were captured in 1978 by Brian PARKINSON and the author in the Ramu Valley. Small numbers were transported to Australia in the 80's. It is uncertain if the fish is still in the Australian hobby. Apparently it has not been distributed to Europe or North America. The species is very abundant throughout its natural range in northern New Guinea.

Habitat of *Chilatherina crassispinosa*, Sermowai River, Irian Jaya



Barred Rainbowfish

Chilatherina fasciata

(WEBER, 1913)

General features: A stream and lake-dwelling rainbowfish from northern New Guinea, growing to 13-14 cm. The colour is variable depending on locality, but is frequently brown to bluish green on the back and white to yellowish on the lower sides with a diffuse dark mid-lateral stripe. Males usually have several diffuse blackish bars on the lower sides, above the front half of the anal-fin base. While courting and spawning the male's colours become very intense and the top of the head radiates a brilliant bronze to vermilion hue.

Aquarium care: This is a very adaptable species, which thrives under a variety of conditions. The natural pH and temperature ranges are 7.5-8.1 and 27-32° C. The diet in the wild consists of micro-crustaceans, insects, and filamentous green algae. Captive fish will accept most standard

Chilatherina fasciata

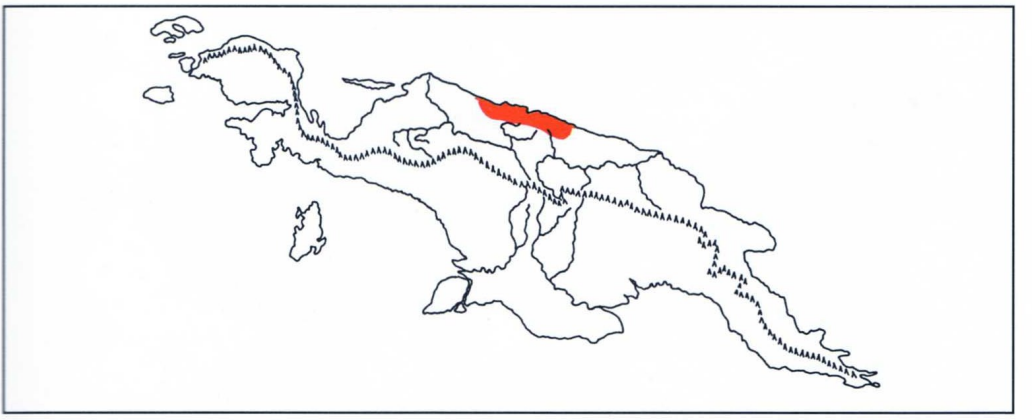
foods, but live items such as daphnia, mosquito larvae, and brine shrimp should be offered 2-3 times a week for the best conditioning.

Breeding: Spawning in captivity presents no problems. It will occur daily if mops or Java moss are provided. Group spawning is recommended. Females should be about the same size, or even larger than the males. Large males can be aggressive during spawning and may inflict damage on smaller mates. Up to 20-30 eggs are spawned daily by each female. It is best to remove them to a separate hatching container. The incubation period lasts about 8-12 days depending on temperature. The young can be fed infusoria and both liquid and dry fry foods for the first week, until large enough for baby brine shrimp.

Distribution and Natural Habitat: The species is widely distributed in northern New Guinea, including the Markham, Ramu, Sepik, and Mamberamo river systems. It mainly occurs in clear, rainforest streams, but has also been collected in lakes (for example, in Lake Wanam, near Lae, Papua New Guinea). The habitat includes both lowland tributaries of major rivers, and hilly terrain to an elevation of about 500 m. The fish often congregate in deeper pools that are exposed to full sunlight for most of the day. It is frequently found with *C. crassispinosa* and *Melanotaenia affinis.*

Status: It was first collected in June 1910 by Dr. P. N. VAN KAMPEN in a stream near Njao, Irian Jaya. Live aquarium specimens were collected by Melbourne aquarist Barry CROCKFORD and the author on several trips to Papua New Guinea in the late 70's and early 80's. It is now widespread in the international aquarium hobby. The species has been present in Europe for more than a decade. It is frequently sold under the name *C. sentaniensis.* The species is very abundant and widespread in the natural habitat.

Habitat of *Chilatherina fasciata,* Meberamo Plains, Irian Jaya



Lorentz's Rainbowfish

Chilatherina lorentzi

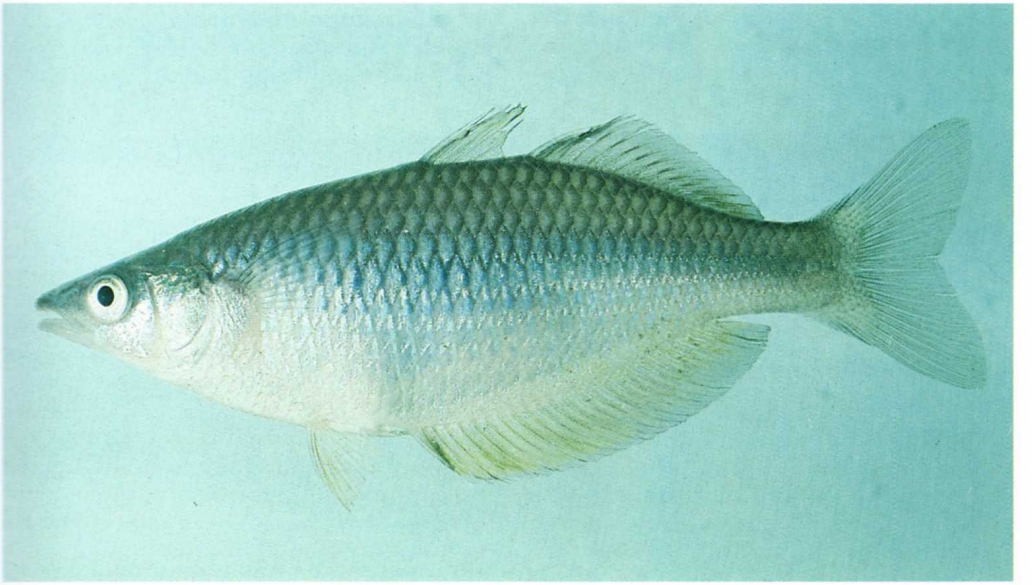
(WEBER, 1908)

General features: A stream-dwelling rainbowfish from northern New Guinea, growing to at least 12 cm. The overall colour is brown or olive on the back grading to silvery or bluish on the sides, and white ventrally. Males have a broad blackish mid-lateral stripe.

Aquarium care: This species has not been maintained in captivity.

Breeding: No information

Distribution and Natural Habitat: It was formerly known only from the Sermowai and Tawarin rivers on the north coast of Irian Jaya, approximately 75 and 200 kilometres west respectively of Jayapura, but I collected several large females from Puive Creek, a tributary of the Pual River, near Vanimo, Papua New Guinea. The latter site is situated about 140 kilometres east of the Sermowai River. The fish were collected in a slow-flowing section of a 5-10 m wide stream that was enveloped by dense

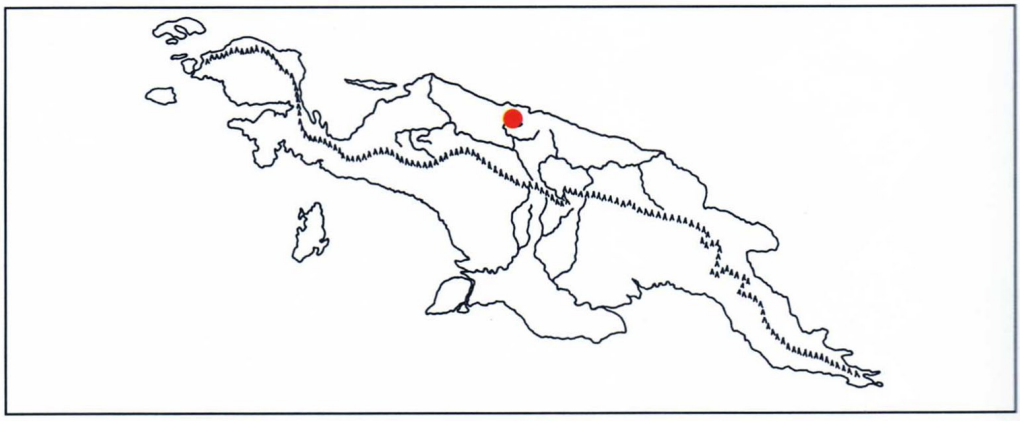


Chilatherina lorentzi

rainforest canopy with minimal sunlight reaching the surface. The bottom was covered entirely with leaf litter. The fishes were concentrated in the deeper (1-2 m) sections in the vicinity of aquatic plants and log debris. The elevation at this site is approximately 300 m above sea level. Temperature and pH were 28° C and 7.8.

Status: This is a poorly known species that was first collected in 1911 by Dr. K. GJELLERUP in the upper Sermowai River (see habitat section for *M. corona).* It was not seen again until I collected several females from Puive Creek near Vanimo in 1979. Unfortunately I did not recognise the species until specimens were later analysed in the laboratory. Otherwise I would have made a special effort to collect males and would have brought back live aquarium specimens. I returned to the area with Heiko BLEHER in 1982, but we failed to find Puive Creek and other streams that were sampled did not yield any specimens. Therefore, the species is yet to be introduced to the hobby.

Habitat of *Chilatherina lorentzi*, near Bewani, Papua New Guinea



Sentani Rainbowfish

Chilatherina sentaniensis

(WEBER, 1908)

General features: A stream-dwelling rainbowfish from northern Irian Jaya, growing to about 12 cm. The overall colour is dull orange with narrow silver or light blue stripes between each scale row. This species has been confused with *C. fasciatus* in the past, but has a much longer, more pointed snout and usually 10 soft dorsal rays compared to 12-14 rays in *C. fasciatus.*

Aquarium care: Contrary to popular opinion, this species has not been maintained in captivity. Published reports and photographs dealing with captive specimens invariably refer to *C. fasciatus.*

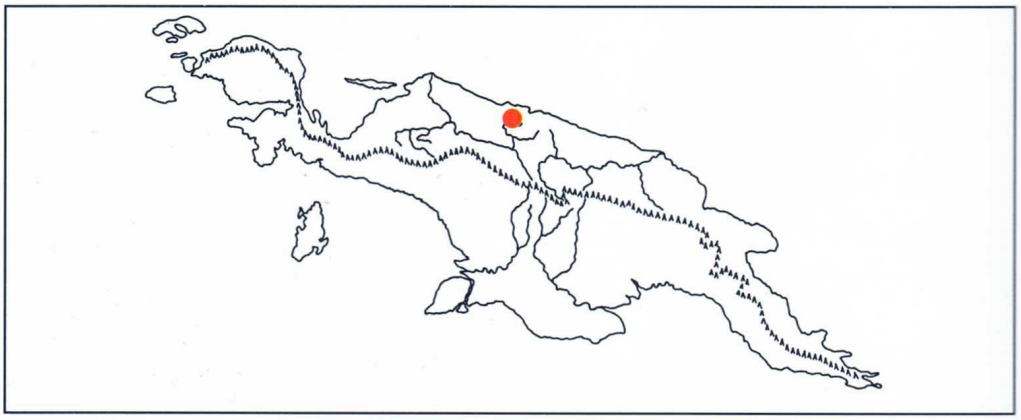
Breeding: No information.

Distribution and Natural Habitat: This species was originally reported to occur only in Lake Sentani, near the Irian Jaya capital city of Jayapura. A large collection of approximately 100 specimens were obtained at the lake by Dr. M. BOESEMAN of the Leiden Museum in 1954. However, more recent investigations (1982 and 1991) by the author failed to find any specimens in Lake Sentani, and a survey by Samuel RENYAAN of Cenderawasih University indicates it may be extinct in this habitat. Although I failed to find it in the lake, it was collected from a tributary stream flowing into the north-eastern end. Several specimens were netted along with a single *C. fasciata* and numerous *Glossolepis incisus*. The creek was about 5-10 m wide, swiftly flowing with a rock and sand bottom. It is locally known as Carwash Creek, as it is a favourite place for passing motorists to wash their vehicles. While we collected there were 4-5 cars being washed in the middle of the creek just a few metres upstream. Temperatures were not recorded, but the creek water was noticeably cooler (estimated 23-25° C) than the lake (estimated 28-29° C).

Habitat of *Chilatherina sentainiensis*, Stream near Lake Sentani, Irian Jaya

Status: This species was first collected by Dr. K. GJELLERUP, a Danish surgeon in the Dutch Army, in February 1911. It has probably never been introduced to the aquarium hobby, although many photographs and several aquarium articles dealing with so called *C. sentaniensis* have been published. All are examples of mis-identification of *C. fasciata*, a species which also occurs in the streams surrounding Lake Sentani. *C. sentaniensis* may be under threat of extinction due to mass introductions of various exotic fish species into Lake Sentani and other disturbances to its habitat. A survey is urgently required to determine its distribution and population size in surrounding streams.

Chilatherina sentainiensis



Red Rainbowfish

Glossolepis incisus

WEBER, 1908

General features: A lake-dwelling rainbowfish from north-eastern Irian Jaya, growing to a size of about 14.5 cm. Males have a unique bright red colouration, often with flecks of silver; females and immature fish are drab brown or olive with silvery reflections on the head and sides.

Aquarium care: An easy species to keep in captivity if suitable water conditions are maintained. The species does not tolerate acid conditions and the optimum pH

Glossolepis incisus

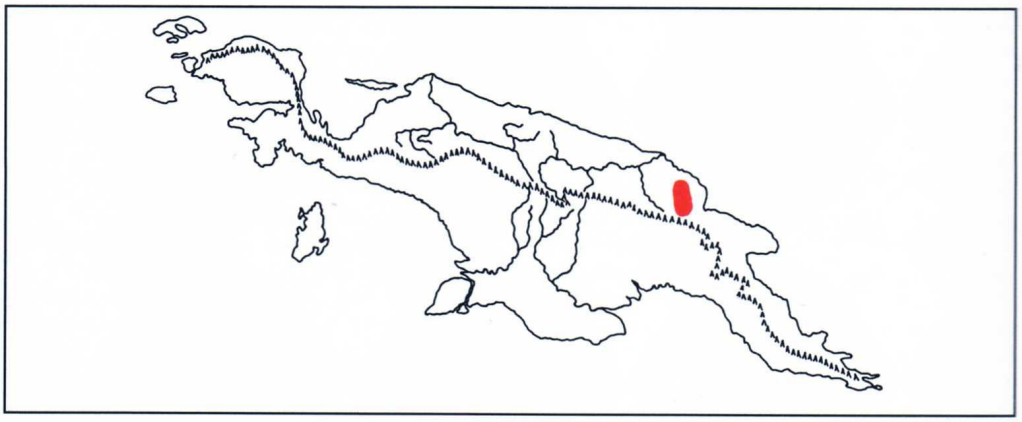
range is 7.2-7.8. Hardness is not critical, at least for adults. Added salt and shell grit are beneficial. Water temperatures between 24° and 28° C are recommended The best coloration is achieved in well lit tanks that are heavily vegetated, which simulates the natural habitat. Tank reared specimens may live 3-5 years. A tank size of at least 150-200 litres is recommended as the species does best in non-crowded conditions. It is suitable for community tanks that contain other similar-sized rainbows. The Red Rainbow is not a fussy eater. It generally accepts a wide range of dried, frozen, and live foods.

Breeding: Egg-laying will occur in community tanks, but the eggs are quickly eaten. It is best to set up pairs or trios (with 2 females) in a separate breeding tank of at least 100 litres for young adults. Ideally the tank should receive early morning sun and there should be adequate hiding places. Males are often aggressive and females may be badly damaged or killed if there is a lack of shelter. It is best to condition the females apart from the male, and they should be closely watched for signs of incompatibility when first placed in the breeding tank. Spawning mops are recommended as they are very convenient for monitoring the egg-laying activity and are easily removed. Spawning usually occurs early in the morning. Each female may deposit as many as 30-50 eggs daily. The eggs are usually spawned towards the top of the mop. They should be removed and placed in a separate nursery tank soon after spawning as the adults are voracious egg eaters. The one-millimetre diameter eggs hatch in 6-7 days at 26° C. The fry are often difficult to raise and it is not uncommon to lose a high percentage of each batch in the first few days. Water conditions should be hard, alkaline, and well filtered. Frequent partial water changes are recommended. The fish need plenty of room as they grow. The addition of shell grit seems to improve their survival. Initial feedings should consist of egg yolk, Liquifry, infusoria, and microworms.

Distribution and Natural Habitat: This species is found only in Lake Sentani, Irian Jaya and small creeks around the edge of the lake. Sentani is situated in hilly terrain at the foot of the spectacular Cyclops Mountain Range. It lies at an elevation of about 75 metres above sea level. A shallow river connects the lake to the sea and probably accounts for the presence of marine trevally and sawfish. However, the latter is now believed to be extinct in Sentani. The lake is characterised by abundant aquatic vegetation, and periodic algal blooms, but the water is usually clear. I last visited Sentani in 1990 and found the Red Rainbowfish to be extremely abundant at several sites. It was easy to catch more than 100 fish with each short tow of a 30-metre seine net. It was also found in at least two rapidly flowing creeks, but within 400 metres of the lake. The red colouration of freshly captured males is very intense. This fish is also offered for sale as food (sold in piles of 30-50 fish) at the Sentani Market.

Status: The species has been established in the aquarium hobby for about 30 years. It was initially introduced to Germany, but is now widespread in Europe, America, and Australasia. The unique red colouration has created a continuous demand. The species is one of the most popular rainbows in the hobby.

Habitat of *Glossolepis incisus*, Lake Sentani, Irian Jaya



Spotted Rainbowfish

Glossolepis maculosus

ALLEN, 1981

General features: A stream and swamp-dwelling rainbowfish from northern Papua New Guinea, growing to about 6 cm. The colour is bronze or greenish, usually with a strong wash of yellow on the sides. There is usually a series of 6-8 large black spots on the sides, occasionally fewer.

Aquarium care: It is very easy to maintain. Four or five specimens can easily be accommodated in only a 30 litre tank. The pH and temperature should approximate the values found in the natural habitat: 7.5-7.8 and 25-28° C. The species will accept most standard aquarium foods. It is important to

Glossolepis maculosus

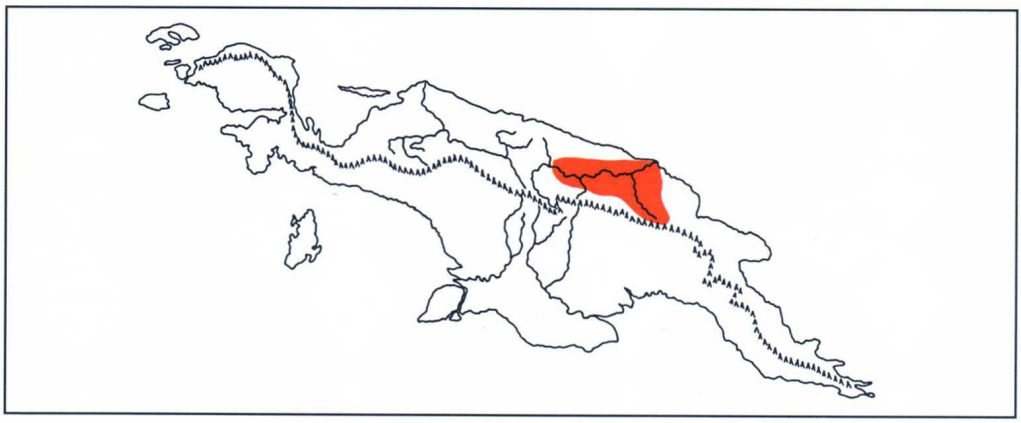
provide live food 2-3 times per week to maintain the best condition.

Breeding: Either pairs or groups (with more females than males) will readily spawn in either mops and Java moss. The eggs should be removed and hatched in trays or a nursery tank. The incubation period is about 9-10 days at 25-26° C. The fry are very small at first, but grow rapidly if properly fed. They should be given infusoria, Liquifry, and finely powdered dry food for the first few days, followed by freshly hatched brine shrimp. Maturity occurs at a very small size, about 3-4 cm, which takes about 6-8 months.

Distribution and Natural Habitat: Known only from a few localities in the Markham and Ramu River systems of northern Papua New Guinea. It has been collected in the Omsis River (a tributary of the Markham), about 24 kilometres west of Lae, where the Bulolo Road first meets the river. Sites in the Ramu system include swamps and creeks near Brahman in the middle Ramu Valley, and Maram Creek, about 20 kilometres north of Josephstaal. The habitat consists of swampy lagoons with dense aquatic vegetation and clear, slow-flowing creeks at elevations between about 150-800 m. It shares the swamp habitat with *Glossolepis multisquamatus.* Stream-dwelling fish may co-occur with *M. affinis, C. campsi,* and *C. crassispinosa.*

Status: The species was discovered in 1979 by Barry CROCKFORD in the Omsis River. A year later I returned to this location with Barry and collected several live fish that were shipped to Australia. These specimens formed the basis of much of the present captive breeding stock. Although still not well established in the hobby, it has been introduced to Europe and North America. The first European specimens arrived in 1987 via Australia. Heiko BLEHER collected a small number of specimens in the Ramu Valley one year later and transported them to Germany. Additional field surveys are required in order to assess the status of wild populations. It does not appear to be very common in the Omsis River and the middle Ramu Valley, but is abundant in Maram Creek.

Habitat of *Glossolepis maculosus,* Ramu Valley, Papua New Guinea



Sepik Rainbowfish

Glossolepis multisquamatus

(WEBER & DE BEAUFORT, 1922)

General features: A, flood-plain dwelling rainbowfish, from northern Papua New Guinea and Irian Jaya, growing to a length of about 14 cm. Adults are variable in colour depending on growth stage, reproductive condition, water quality, and locality. The general ground colour ranges from greenish or olive to brown or reddish. There is a series of narrow yellow, orange, or reddish stripes between each horizontal scale row. Fins are somewhat variable, but frequently greenish to nearly black, occasionally reddish. Older males become very deep-bodied.

Aquarium care: This species does best in a large, well-planted aquarium. I have only

Glossolepis multisquamatus

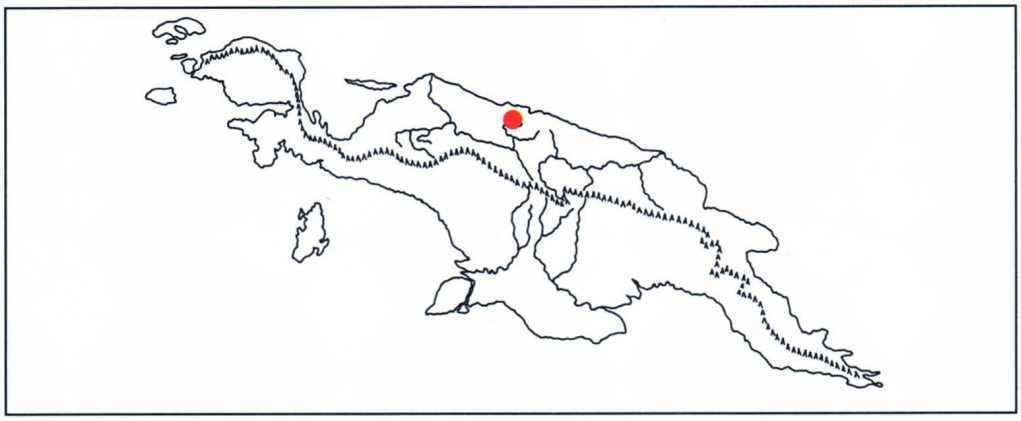
kept it separately, usually in groups of about 10-15 fish (containing 3-5 adult males), but it is probably suitable for a community tank if similar-sized fishes are present. It should not be kept with the smaller rainbows and blue-eyes as it may become aggressive. Recommended temperature and pH is 27-29° C and 6.2-6.8, which approximates the range found in the natural habitat.

Breeding: It spawns readily in captivity without problems. I have used a large (350 litre), well planted tank with abundant Java moss. When young are desired it is only a matter of removing the moss daily and replacing it. Spawning usually occurs in the morning and a few eggs are released by each female every day. It takes about 7-10 days (at 23-25° C) until hatching after removing the egg-laden moss to a separate nursery tank. The fry grow rapidly and become sexually mature before the end of their first year.

Distribution and Natural Habitat: This species is found on the floodplains of the large northern rivers of New Guinea, including the Ramu, Sepik, and Mamberamo. It is seldom found in the main rivers, instead preferring swampy lagoons, ox-bow lakes, cut-off arms of rivers, and side tributaries. These habitats usually are characterised by turbid water and an abundance of aquatic plants, and are frequently exposed to full sunlight. Young fish form aggregations around submerged logs and branches, or among reeds and other shoreline vegetation.

Status: This fish was first discovered in the Mamberamo system by Dutch explorers in the early part of this century. It was also captured by subsequent expeditions in the 30's and 50's. I first encountered it during a visit to the Sepik in the year 1979 and also brought back live fishes to Australia. This formed the basis of the present captive breeding stock. Heiko BLEHER captured additional fish from the Mamberamo area in 1992, and their progeny are now appearing in the hobby. This species is very abundant in the natural habitat. As with other widely distributed rainbows, there is considerable variation in the colour of the body and fins.

Habitat of *Glossolepis multisquamatus*, Outlying lake of the lower Ramu River



Tami River Rainbowfish

Glossolepis pseudoincisus

ALLEN & CROSS, 1980

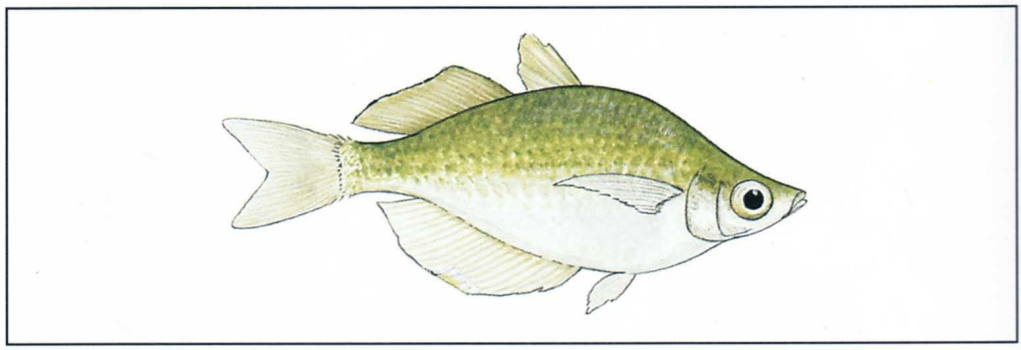
General features: A flood-plain dwelling rainbowfish from Irian Jaya, growing to at least 9.5 cm. Its live colours are unknown, but it is probably olive or brownish overall with a silvery sheen on the head and sides.

Aquarium care: This species has not been maintained in captivity.

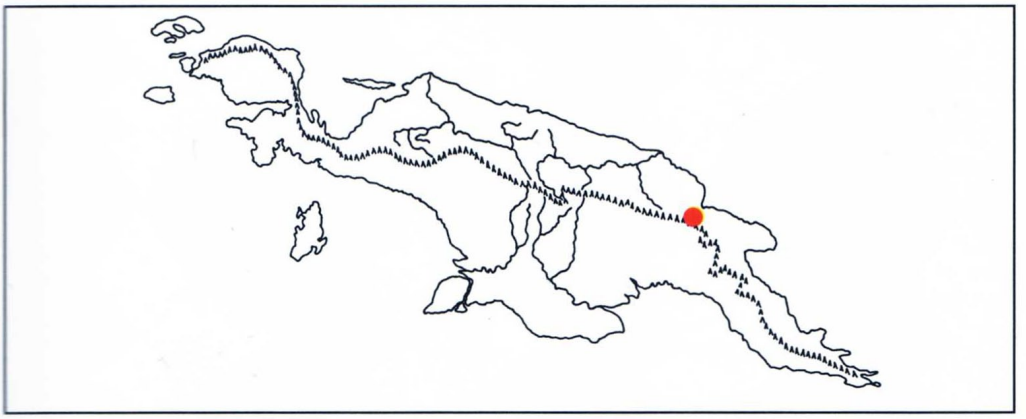
Breeding: No information, but probably similar to *G. incisus.*

Distribution and Natural Habitat: The only known specimens were collected from a cutoff arm of the Tami River in Irian Jaya. This locality is on the north coast, about 22 kilometres south-east of Jayapura towards the border with Papua New Guinea. The pond-like habitat was approximately 35-40 m wide and surrounded by dense rainforest. The bottom consisted of mud with an abundance of aquatic vegetation. The water was semi-stagnant and turbid. Although the fish was found only at this site it is probably common throughout the lower Tami River, which is characterised by a strongly meandering main channel with numerous cut off arms, oxbow lakes, and swampy lagoons.

Status: The species was first collected in November 1954 by Dr. M. BOESEMAN, former Curator of Fishes at the Rijksmuseum in Leiden. It has not been sighted since then. However, access to this region has been prohibited by the Indonesian government in recent times. It is therefore unlikely that it will be introduced to the hobby in the near future. A survey of the Tami River is urgently required to assess its present status.



Glossolepis pseudoincius



Ramu Rainbowfish

Glossolepis ramuensis

ALLEN, 1985

General features: A stream-dwelling rainbowfish from northern Papua New Guinea, growing to about 7.5 cm. Males are greenish-brown to purplish on the back and white or mauve on the lower half. There are several narrow orange stripes on the sides, those on the middle of the body and tail base are the most vivid.

Aquarium care: It is a very attractive fish that thrives in captivity. It lives in swift-flowing creeks and is a very rapid swimmer. Therefore it requires plenty of space, in spite of its small size. A tank that is at least one m long is ideal. It can be kept alone or with other peaceful species. Males are often aggressive and continuously chase each other, but rarely inflict damage. Feeding is not a problem as it readily accepts all standard foods.

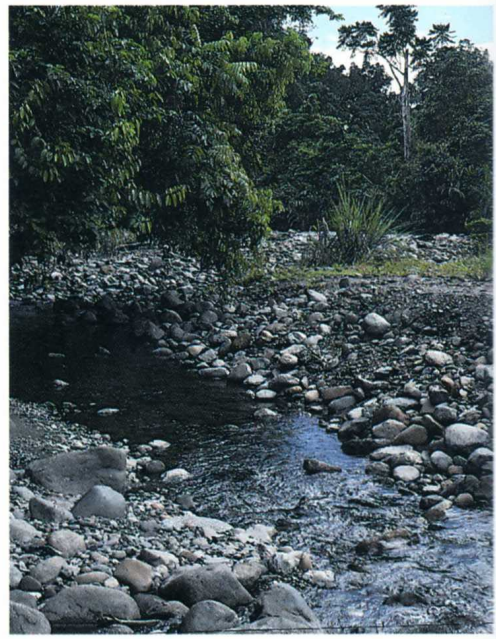
Breeding: It will spawn in both mops and Java moss. The eggs should be removed and hatched in trays or a nursery tank. The incubation period is about 9-10 days at 26° C. The fry can be given standard "starter" foods for the first week until they are large enough for baby brine shrimp and microworms. Growth is very slow at first,

Glossolepis ramuensis

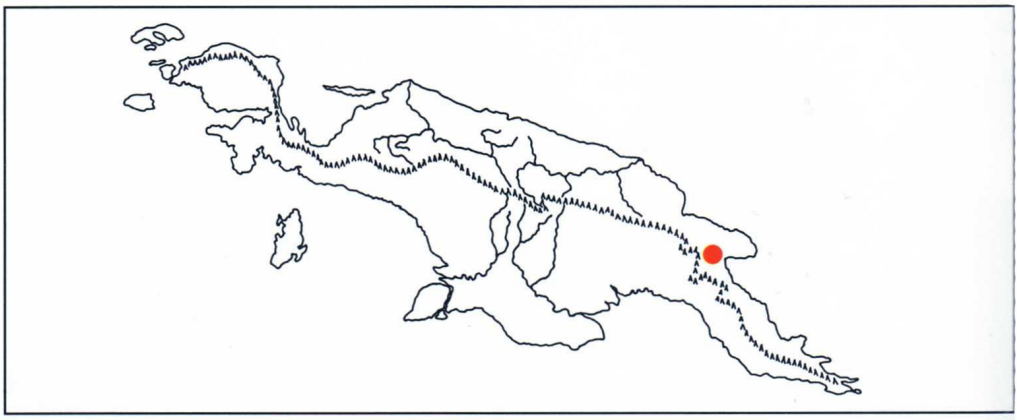
but colours begin to show after three months.

Distribution and Natural Habitat: Known only from the Ramu Valley and tributaries of the Gogol River near Madang, Papua New Guinea. It lives in small (1-5 m wide) creeks flowing through rainforest. The streams generally have clear water, a gravel bottom, and very few aquatic plants. Temperature and pH ranges from 26-29° C and 7.4-7.9. It is sometimes found together with *C. campsi* and *M. affinis.*

Status: The species was discovered in 1983 by R. STEENE and the author near Walium Village in the middle Ramu Valley. Live specimens were captured by Heiko BLEHER from a tributary of the Gogol River in 1988. These were transported to Germany and form the basis of current aquarium stock. The fish is becoming increasingly popular in North America and Europe. It is apparently rare in the Ramu Valley, but is abundant in tributaries of the Gogol River.



Habitat of *Glossolepis ramuensis*, Gogol River, Papua New Guinea



Lake Wanam Rainbowfish

Glossolepis wanamensis

ALLEN & KAILOLA, 198

General features: A lake-dwelling rainbowfish, from Papua New Guinea, growing to a length of about 13 cm. Adult males are dusky orange on the anterior half of the body, becoming blue or greenish towards the tail. The back is frequently metallic green. The long graceful dorsal and anal fins are turquoise green to nearly black in some individuals.

Aquarium care: This species does relatively well, once it is acclimatised to aquar-

ium surroundings. It is relatively delicate compared to most rainbow species and is very sensitive to sudden changes in water chemistry and temperature. It is also susceptible to shock during transport. It is best to keep them in groups with a surplus of females. A well planted tank with a capacity of at least 100 litres is recommended. Optimal temperature and pH are 26-28° C and 7.5-7.8 respectively. Occasional live foods and vegetable matter should be included in the diet.

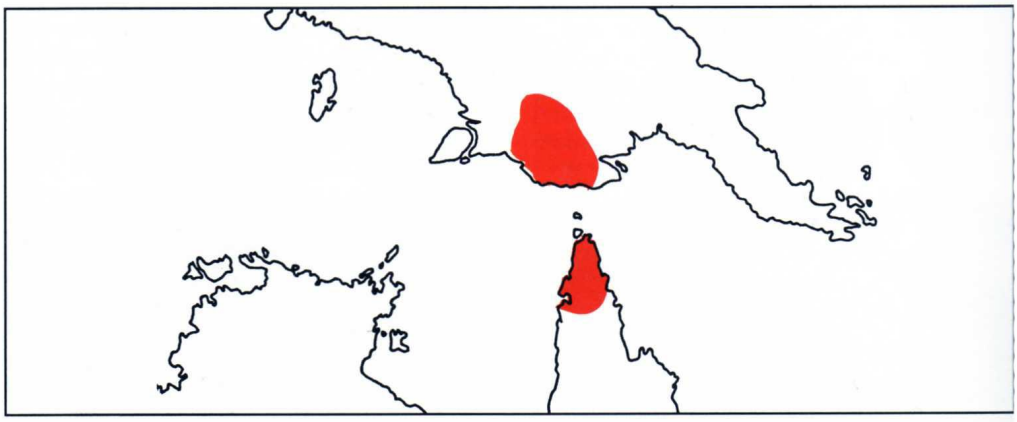
Breeding: I have not used mops with this species, but it will readily deposit eggs if a dense mat of Java moss is provided. After about one week the egg-containing moss should be removed to a hatching tank. Hatching occurs after about two weeks. The 5-mm long fry will eat boiled egg yolk and fine infusoria initially, and after a week or two will accept freshly hatched baby brine shrimp. Growth is very slow until a size of about 8-10 mm is reached, but then proceeds more rapidly if ample space and a high-protein diet are provided. They become sexually mature in about 8-10 months at a length of about 6-7 cm.

Distribution and Natural Habitat: It is confined to Lake Wanam, about 24 kilometres west of Lae in eastern Papua New Guinea. The lake is situated on a small plateau about 150 m above the Markam River Valley, and is only about 2-3 kilometres in diameter. The fish is found in shallow, clear, sunlit waters among dense vegetation (mainly *Vallisneria*, *Myriophyllum*, and *Nymphaea*). Temperature and pH values of 28.5-28.9°C and 7.8-7.9 were recorded. The lake is also inhabited by *Chilatherina fasciata*, introduced African Tilapia (*Oreochromis mossambica*) and the notorious Saltwater Crocodile (*Crocodylus porosus*). Several fatal crocodile attacks have occurred over the past 25 years. The attacks mainly involved spearfishermen who were in pursuit of tilapia.

Glossolepis wanamensis

Status: Live specimens were first collected and transported to Australia by the author and Barry CROCKFORD in 1978 and 1980. Great difficulties were encountered in obtaining enough fish for an initial breeding stock due to heavy mortality during transport. Nearly all of the collected fishes died during the 7 kilometre walk and 30 kilometre drive between Lake Wanam and Lae. Barry CROCKFORD was the first to successfully breed the fish in captivity, and most of the fish now in the hobby originated from his stock. It is now available in Australia, North America, and Europe, but still in relatively small numbers. It was very abundant when I last visited the lake in 1980, but there are no recent reports concerning its status.

Habitat of *Glossolepis wanamensis*, Lake Wanam near Lae, Papua New Guinea



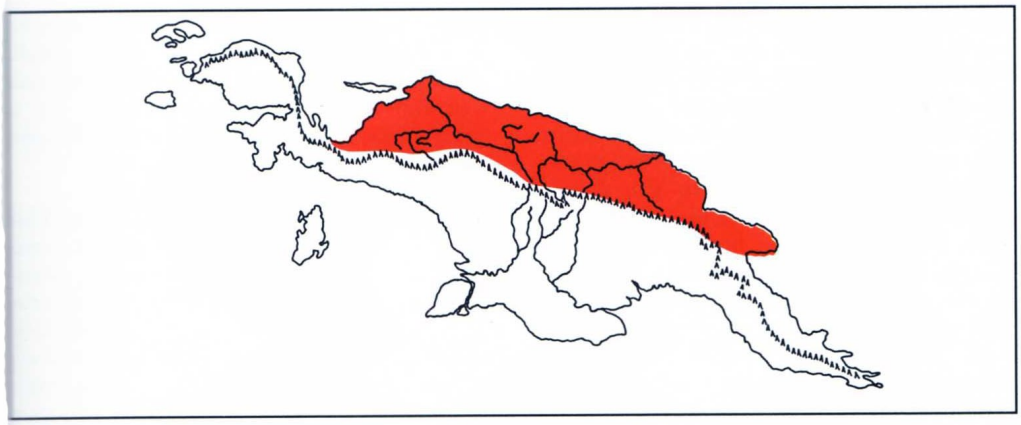
Iriatherina werneri

Threadfin Rainbowfish

Iriatherina werneri

MEINKEN, 1980

This species occurs in both Australia and New Guinea. Coverage is provided in the section dealing with Australian rainbowfishes on page 46.



Northern Rainbowfish

Melanotaenia affinis

(WEBER, 1908)

General features: A stream-dwelling rainbowfish from northern New Guinea, growing to about 14 cm. The colour is variable depending on locality. Three main varieties are presently widespread in the aquarium hobby: *Normal variety* - The back is olive to bronzy and the lower half is white. There is a prominent blue-back mid-lateral stripe that is faint or interrupted on the anterior part of the body and expanded on the tail base where it has yellowish margins. *Pagwi variety* - The back is sky blue and the lower half is white to yellowish. The black mid-lateral stripe is prominent and has bright red-orange margins on

Melanotaenia affinis

the rear half of the body. There is also a broad pale yellow stripe just below the black mid-lateral stripe. *Bluewater Creek variety* - The back is greenish-blue with silvery reflections and the lower half is white. The mid-lateral dark bar has similar characteristics to that found in the normal variety, but is usually more blue than black. The mid-lateral stripe has a broad white margin on the lower edge, which is separated from the pale-coloured lower side by a diffuse bluish-black stripe.

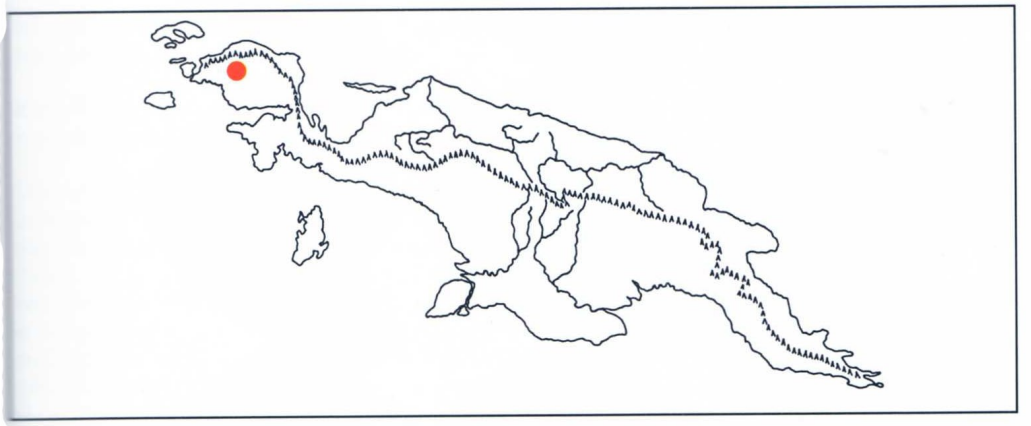
Aquarium care: This is one of the easiest rainbows to maintain in captivity. It is very adaptable in a variety of aquarium situations, regardless of whether it is kept alone or in a mixed community. Regular water changes (20-30 percent) and live food will insure optimum colouration. The recommended temperature and pH range is 25-28° C and 7.0-8.0.

Breeding: It is an easy species to breed and a very prolific spawner. It will spawn in both pair and group situations. Pairs should be similar in size as the male may be overly aggressive if the female is too small. Hatching time is 7-10 days at temperatures between 24-28° C. Growth of the fry is fairly rapid. If properly fed they will reach about 3 cm after four months.

Habitat of *Melanotaenia affinis*, Bidges River near Madang, Papua New Guinea

Distribution and Natural Habitat: This is the most common rainbowfish over much of northern New Guinea. The distribution includes the Markham, Ramu, Sepik, and Mamberamo river systems and many smaller independent drainages along the coast. It mainly occurs in clear, rainforest streams, but has also been collected in swamps and a few lakes. It is most common in well-shaded rainforest creeks at lower elevations, but also occurs in mountainous terrain (for example the Baiyer and Snake rivers of Papua New Guinea) to an altitude of about 1500 m. It is often found with other rainbows, particularly species of *Chilatherina* and *Glossolepis*.

Status: It was first collected in June 1910 by Dr. P. N. VAN KAMPEN in a stream near Njao, Irian Jaya. The first live aquarium specimens (normal variety) were collected near Lae by Melbourne aquarist Barry CROCKFORD and the author on several trips to Papua New Guinea in the late 70's and early 80's. The beautiful Pagwi variety, known only from a small tributary of the Sepik River near Pagwi Village, was first collected by David COATES and the author in 1982. Aquarium specimens from this same collection were subsequently shipped to Australia. The Bluewater Creek variety is restricted to a crystal-clear, spring-fed creek near Madang, Papua New Guinea. It was collected by Heiko BLEHER and the author in 1988, and specimens were transported to Germany. It has sometimes been mis-identified as *Glossolepis ramuensis*. All three varieties are now well established in the hobby. They are also abundant in the natural habitat. The normal variety is very widely distributed and is abundant throughout its range.



Ayamaru Rainbowfish

Melanotaenia ajamaruensis

ALLEN & CROSS, 1980

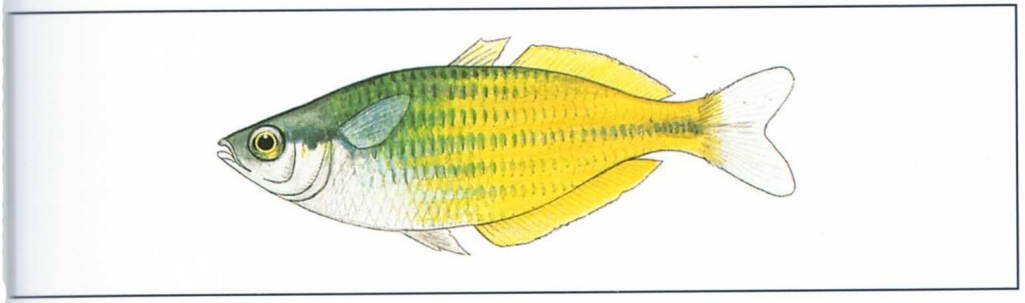
General features: A lake-dwelling rainbowfish from the Vogelkop Peninsula of Irian Jaya, reaching about 11 cm. The live colouration is unknown, but judging from preserved specimens it is probably similar to Boeseman's rainbow.

Aquarium care: This species has not been maintained in captivity.

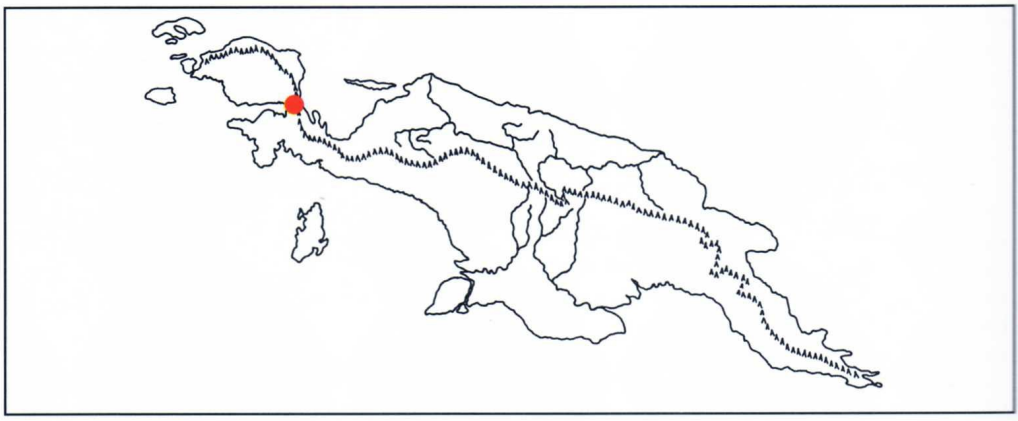
Breeding: No information, but probably typical of other *Melanotaenia* species.

Distribution and Natural Habitat: This fish was first collected in March 1955 from the Ayamaru (sometimes spelled Ajamaru) Lakes region of the Vogelkop Peninsula by Dr. M. BOESEMAN, former Curator of Fishes of the Rijksmuseum in Leiden. This locality is situated at the headwaters of the Ayamaru River, which flows into the Kais, a southerly flowing river that runs into the Ceram Sea. Ayamaru Lake is in a swampy basin (elevation about 55 m above sea level) surrounded by low hills. It is very shallow (estimated maximum depth about 10 m), relatively clear, with abundant aquatic vegetation. The lake and surrounding creeks are strongly alkaline with pH in excess of 8.0.

Status: This is a genuine "mystery" fish. It has not been seen since it was first discovered in 1955. The author visited Lake Ayamaru with Heiko BLEHER in 1982, but we failed to collect any. However, we were unable to catch fishes in the actual lake as it was too deep to use a seine net, and was clogged with vegetation. Unlike *M. boesemani*, which occurs in this region and is found both in lake and stream habitats, it is possibly confined to the lake only. Further surveys are required to establish the population status and ecological details.



Melanotaenia ajamaruensis



Angfa Rainbowfish

Melanotaenia angfa

ALLEN, 1990

General features: A stream-dwelling rainbowfish from western Irian Jaya, growing to at least 12.5 cm. Mature fish are bright yellow (including fins) with a relatively narrow mid-lateral black stripe, which is interrupted along its length by narrow yellow streaks. Similar in overall appearance to *M. herbertaxelrodi*, but has more anal fin rays (20-22 compared to 17-18) and grows to a larger size.

Aquarium care: This species has not been maintained in captivity, but its care should

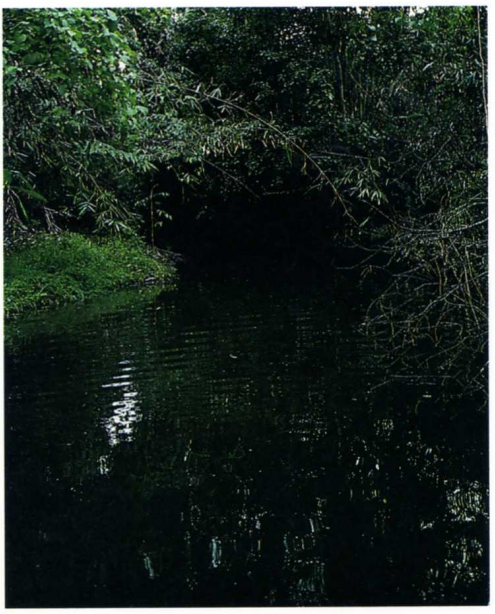
Melanotaenia angfa

be similar to other closely related species such as *M. herbertaxelrodi* and *M. trifasciata.*

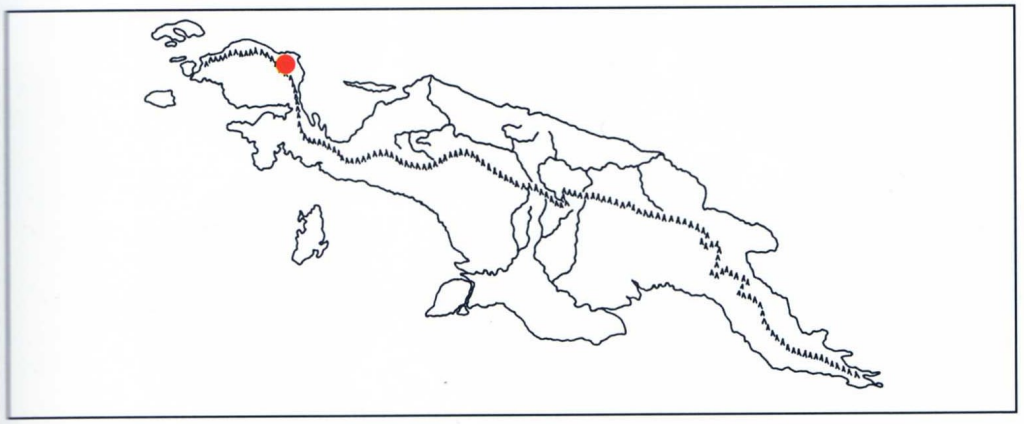
Breeding: No information, but is probably typical of other *Melanotaenia* species.

Distribution and Natural Habitat: It has only been collected in two small creeks in the Yakati River system of Irian Jaya. The Yakati is located in the narrow isthmus connecting the Vogelkop Peninsula and the remainder of Irian Jaya. The habitat is situated in a hilly region covered by dense rainforest. Both streams were characterised by slow to rapid-flowing water with rock or sand bottom and minimal aquatic vegetation.

Status: This fish was first discovered by the author in 1989 during a conservation survey of Bintuni Bay. It is only known from a very remote section of Irian Jaya and is yet to be introduced to the hobby. It is unlikely to make an appearance in the foreseeable future.



Habitat of *Melanotaenia angfa*, Kurumoi Creek, Irian Jaya



Arfak Rainbowfish

Melanotaenia arfakensis

ALLEN, 1990

General features: A stream-dwelling rainbowfish from western Irian Jaya, growing to about 10 cm. Mature fish are overall mauve with silvery reflections. There is a bluish mid-lateral stripe, about one scale wide, and a narrow yellow-orange stripe between each horizontal scale row on the side of the body. Fins are translucent with a bluish to mauve cast. The second dorsal fin has a submarginal black band and narrow white margin. The caudal fin has black upper and lower margins.

Aquarium care: There is little information. An aquarist at Manokwari, Irian Jaya kept approximately two dozen fish in a

Melanotaenia arfakensis

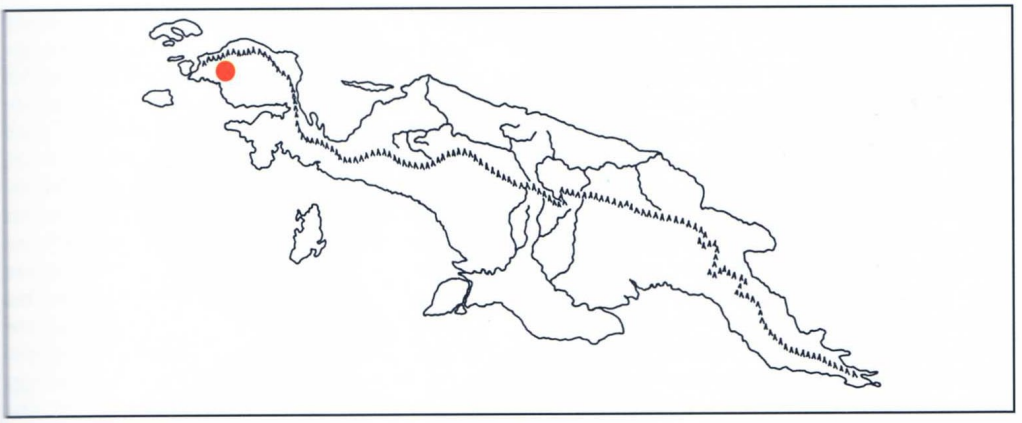
100-litre aquarium. He reported that it was an easy species to maintain and accepted a wide variety of dry, frozen, and live foods.

Breeding: No information, but is probably typical of other *Melanotaenia* species. Eggs were found in a stream in Irian Jaya attached to the hair-like roots of dead grass caught in a log snag.

Habitat of *Melanotaenia arfakensis*, Prafi River, Irian Jaya

Distribution and Natural Habitat: This is a stream-dwelling fish, which I first discovered in 1989. It is known only from the Prafi Plains, an alluvial valley of the Prafi River, about 20-30 kilometres west of Manokwari. The latter is a district centre at the north-eastern corner of the Vogelkop Peninsula. This valley is bordered on the western side by the scenic Arfak Mountains. The area is a government center of transmigration and is becoming rapidly populated by migrants from western Indonesia. Unfortunately the natural habitat is under threat from land clearing for the cultivation of oil palm. The fish is found in the main river as well as tributaries. It was relatively abundant in 1990 in rapid to slow-flowing sections bordered by natural rainforest and also where the forest was partially cleared for agriculture.

Status: Conservation measures are required to preserve the natural habitat. It is possible the species is found outside the Prafi Valley. It may eventually prove to be widespread in drainage systems along the north coast of the Vogelkop Peninsula. A number of fish were exported to Germany in 1990, but it is not yet well established in the hobby. It is an attractive species, which should be well received once it is more widely introduced.



Boeseman's Rainbowfish

Melanotaenia boesemani

ALLEN & CROSS, 1980

General features: A lake-dwelling rainbowfish from western Irian Jaya, reaching about 11.5 cm. It is one of the most beautifully coloured rainbows. The head and anterior part of the body is blue-grey and rear half is bright orange, with 2-3 narrow dark bars between these two zones. The attractive fins are orange with a distinct white outer margin on the two dorsals. Females are similar, but their colours are far less intense, especially on the rear half.

Aquarium care: A very easy species to maintain in captivity. It has a peaceful disposition and is therefore suitable for a community tank. However, I recommend keeping it separately. A well-planted tank with

Melanotaenia boesemani

10-20 individuals makes a stunning display, and the fish will readily spawn in this type of environment. Water changes at 2-4 week intervals are recommended, in which about 25-30 percent of the content is exchanged. Chlorinated tap water is acceptable for adults, but aged water should be used when making water changes in tanks with young fish. Recommended pH and temperature are 7.0-8.0 and 25-28° C respectively. All standard aquarium foods are accepted, but a regular supply of live foods such as adult artemia or mosquito larvae are recommended to insure maximum colouration in adult males.

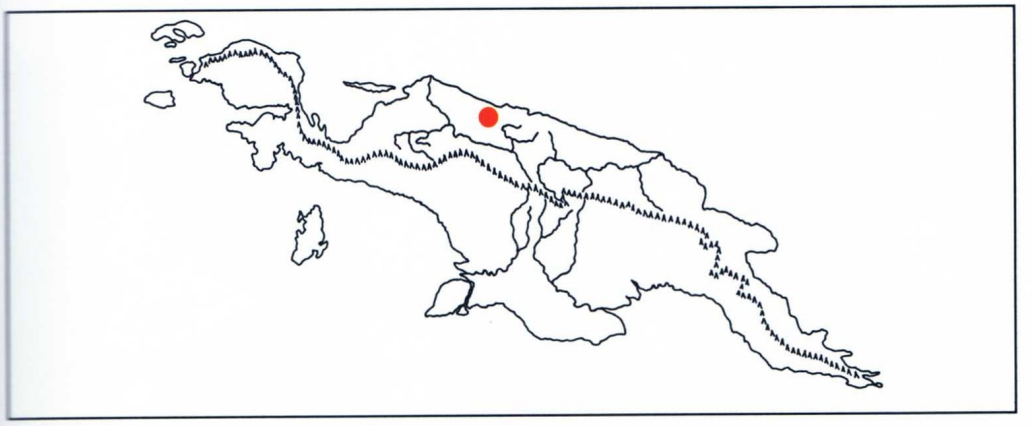
Breeding: This is one of the easiest rainbowfish species to breed in captivity. They will readily spawn in a group situation or in an isolated breeding tank (minimum size about 60 l) containing a male and 2-3 females. An abundance of live and frozen foods is useful for conditioning. The tank should be supplied with either a spawning mop or mat of Java moss to receive the eggs. Sexually aroused males flash a frosty white colouration on the top of the head and are very aggressive. Spawning occurs daily, with each female depositing up to about 10-20 eggs. These require about 2 weeks until hatching at 25° C. Unlike most other members of the family, Boeseman's rainbow frequently ignore their eggs and fry. Therefore they can remain with the adults, provided the tank is heavily planted. However, I have had occasional problems with egg-eating parents. If this proves to be the case, the eggs should be removed to a nursery tank. The newly hatched babies can be fed Liquifry, strained egg yolk, fine powder fry food, or combination of all of these items. After about one week the diet can be supplemented with freshly hatched artemia.

Distribution and Natural Habitat: Endemic to the Ayamaru (sometimes spelled Ajamaru) Lakes region in the center of the

Habitat of *Melanotaenia boesemani*, Lake Ayamaru, Irian Jaya

Vogelkop Peninsula. This locality is situated at the headwaters of the Ayamaru River, which flows into the Kais, a southerly flowing river that runs into the Ceram Sea. The fish is found mainly in Lake Ayamaru and a few surrounding tributaries, but it also occurs in nearby Lake Hain and in Lake Aitinjo, about 20 kilometres to the south-east. Ayamaru Lake is in a swampy basin (elevation about 55 m above sea level) surrounded by low hills. It is very shallow (estimated maximum depth about 10 m), relatively clear, with abundant aquatic vegetation. The lake and surrounding creeks are strongly alkaline with pH in excess of 8.0. Large shoals of Boeseman's rainbowfish were observed when the author visited in 1982. The fish was also very abundant in several small creeks running into the lake.

Status: The species was introduced to the hobby in 1983 by Heiko BLEHER, who imported specimens to Germany. It has rapidly increased in popularity ,and along with *Glossolepis incisus*, is one of the two most sought after species. It is now widely available in the hobby throughout the world. By 1989 Ayamaru villagers were catching so many live fish for the aquarium trade it was on the brink of becoming endangered. An estimated 60,000 male rainbows were being captured each month for shipment to Jakarta exporters. Sadly, the shipping mortality rate was approximately 90 percent. Most of the losses were suffered in the initial stages when fish were crammed into 20-litre water cans for the 2-hour walk to the airstrip. Fortunately, the government eventually placed controls on the industry.



Corona Rainbowfish

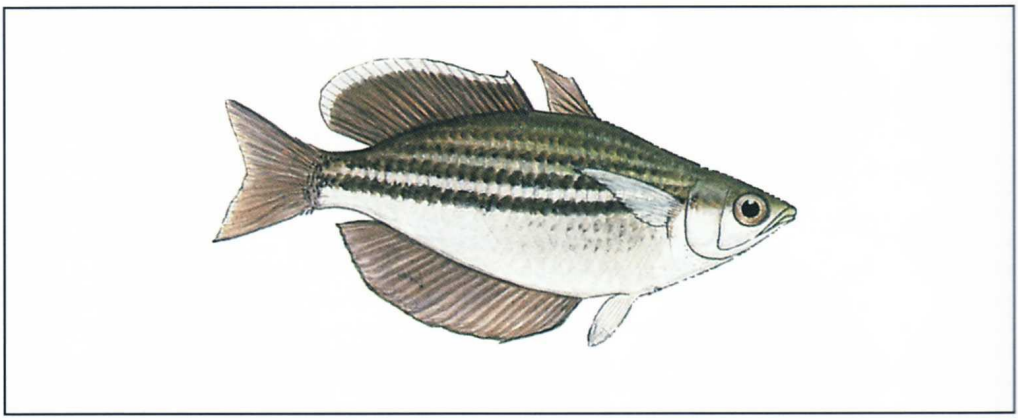
Melanotaenia corona

ALLEN, 1982

General features: A stream-dwelling rainbowfish from north-eastern Irian Jaya, growing to at least 12.5 cm. Live colours are unknown, but it has four dark (possibly purple) stripes (each about one scale wide) on the upper side, a dark second dorsal fin with a broad white margin, and a uniformly dark anal fin. The second dorsal and anal fins are unusually tall compared to those of other members of the genus. The longest rays are situated in the middle part of these fins, a feature that is typical of some *Glossolepis*.

Aquarium care: This species has not been maintained in captivity.

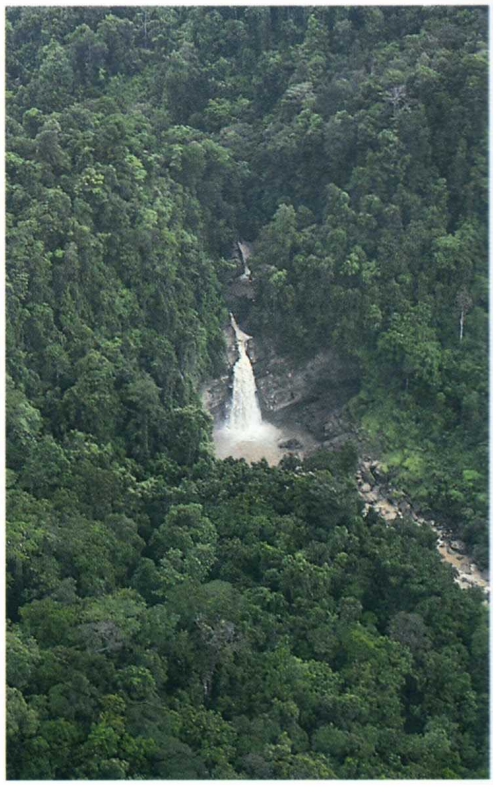
Breeding: No information, but probably typical of other *Melanotaenia* species.



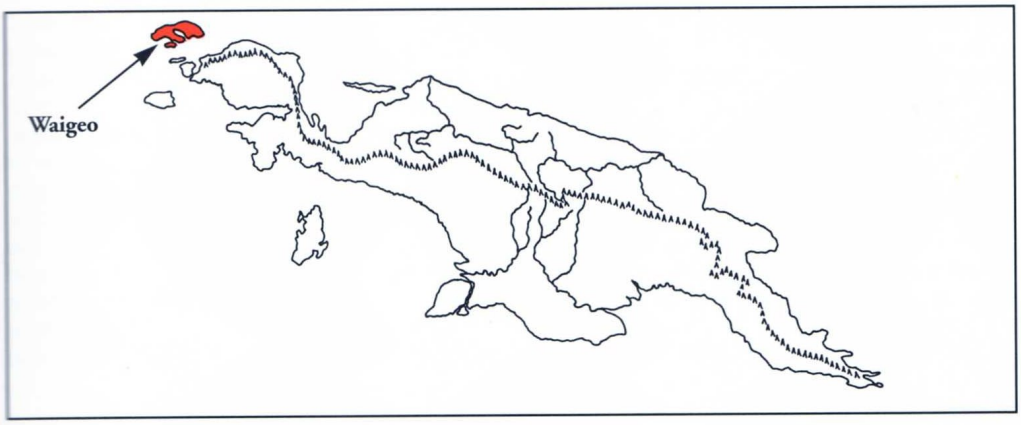
Melanotaenia corona

Distribution and Natural Habitat: Known only from the Sermowai River on the north coast of Irian Jaya, about 75 kilometres west of Jayapura. The author visited this area in 1991 via a new road linking Jayapura and the interior village of Lereh, but failed to find the fish due to floods. The large waterfall mentioned in GJELLERUP's journal (see below) is very obvious from the air, but not easily seen from the road, which passes within about 300 metres. It apparently occurs with several other rainbows in the Upper Sermowai including *Chilatherina crassispinosa, C. fasciata, C. lorentzi*, and *Melanotaenia affinis.*

Status: This is perhaps the rarest and most poorly known of all rainbowfish species. Only two specimens, both adult males, have ever been collected. They were captured in the Sermowai River by Dr. K. GJELLERUP in early May 1911. Ironically it was not described until 1982, shortly after the author located the specimens in an uncatalogued jar at the Zoological Museum in Amsterdam. According to GJELLERUP's narrative report he went up the Lower Sermowai river by boat for 3 days until a large waterfall was encountered. They climbed 400 metres to get above the falls and then spent 3 days in the Upper Sermowai Valley, where the specimens of *M. corona* were collected. This species is presently unknown in the hobby, but has the potential to be one of the most popular rainbows, due to its striking pattern and unusual fin shape.



Habitat of *Melanotaenia corona*, Upper Sermowai River, Irian Jaya



Waigeo Rainbowfish

Melanotaenia catherinae

(DE BEAUFORT, 1910)

General features: A stream-dwelling rainbowfish from Waigeo, Island, Irian Jaya, growing to at least 10 cm. Adult fish are bluish to light brown on the back and white on the lower side with a beautiful blue mid-lateral stripe (up to 2 1/2 scales wide). Dorsal, anal and caudal fins are reddish. It is similar in appearance to *M. affinis*, which is a close relative.

Aquarium care: This is a peaceful fish well suited for a community tank or can be kept alone in schools. It tolerates a wide range of conditions including temperatures of 22-28°C, pH between 6.0-8.5, and GH 1-30.

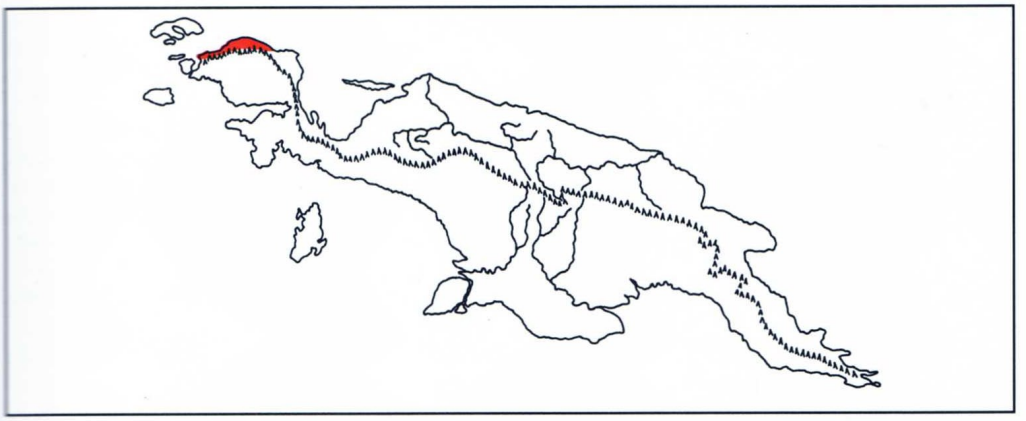
Melanotaenia catherinae

Breeding: Typical for *Melanotaenia*. It spawns readily in mops or Java moss. Eggs should be removed to a nursery tank for hatching.

Distribution and Natural Habitat: This species is found only on Waigeo Island, situated about 50 kilometres north of the western end of the Vogelkop Peninsula. This location was made famous by the British naturalist sir Alfred Russel WALLACE, who stayed there for several weeks in 1860, meticulously recording notes about the island and its extraordinary biological wealth. Some travellers claim that Waigeo is the most beautiful island on earth, the perfect tropical paradise. It is a large island, approximately 125 kilometres long and up to 50 kilometres in width, that is divided into two sections by a 35 kilometre-long bay. The bay is ringed by rugged mountains and has a very narrow opening, giving it the appearance of a huge saltwater lake. The limestone island is very mountainous and covered with virgin rainforest. Its highest peak rises to an elevation of 1000 m. The island still remains largely unexplored as far as fishes are concerned, but the Waigeo rainbowfish has been collected from several creeks and springs situated in dense rainforest. Heiko BLEHER recorded a very low temperature of 19° C in one spring where the fish was abundant.

Status: The first aquarium specimens were imported to Germany by Heiko BLEHER in 1992. It is still relatively unknown in the hobby, but is expected to become well established.

Habitat of *Melanotaenia catherinae*



Serong Rainbowfish
Melanotaenia fredericki
(FOWLER, 1939)

General features: A stream-dwelling rainbowfish from western Irian Jaya, growing to at least 12 cm. Mature fish are mauve with blue reflections on the back and broad yellow scale margins on the middle of the body (the yellow areas sometimes forming weak stripes on the sides). The fins are mainly clear, but the dorsal, anal, and caudal may have yellow or red tints.

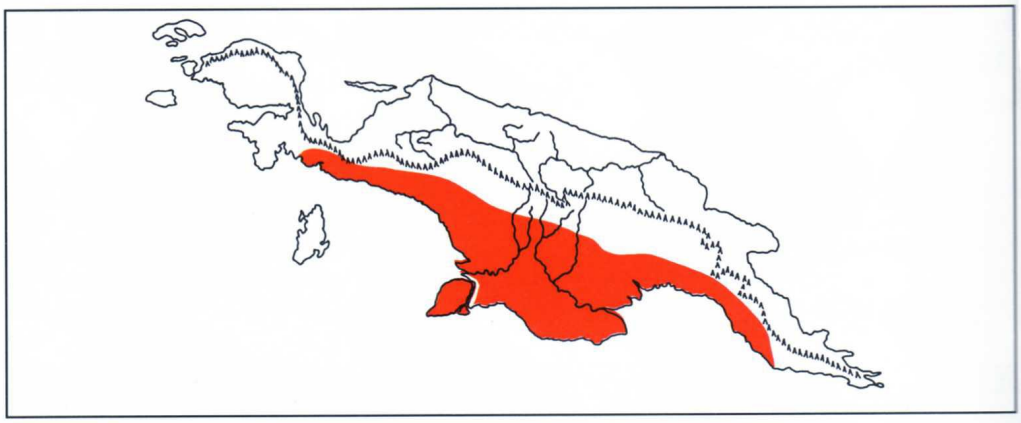
Aquarium care: No information, but its care should be typical for other members of the genus *Melanotaenia.*

Breeding: No information, but is probably typical of other *Melanotaenia* species.

Melanotaenia fredericki

Distribution and Natural Habitat: It has only been collected in a few small creeks in the vicinity of Sorong at the western end of the Vogelkop Peninsula. One of these runs through a government (PHPA) forestry reserve about 30 minutes drive south of the town. It is also known from the Sampson River basin to the north of Sorong. Further exploration is necessary to define the true limits of distribution. It probably also occurs on the nearby island of Salawati The forestry reserve habitat consisted of a 1-2 metre wide, clear, slow-flowing stream in a nearly closed canopy rainforest. The fish was confined to the deeper (0.5-1.0 m) pools, and was not particularly common.

Status: It was first described from juvenile specimens collected in the 1930's. The first adult were collected by the author in 1989. Live specimens were captured and exported to Germany by Heiko BLEHER three years later. It is now becoming popular in the hobby. The distribution of this fish in the wild remains poorly known.



Goldie River Rainbowfish

Melanotaenia goldiei

(MACLEAY, 1883)

General features: A stream-dwelling rainbowfish from southern New Guinea, growing to about 14 cm. It is brownish with a coppery sheen on the back and white on the lower half with a dark blue mid-lateral stripe, about two scale rows wide. There is a narrow, copper or orange-coloured stripe between each scale row on the upper half of the body. The scales on the lower side (particularly the breast region) frequently have a dark outline.

Aquarium care: It is easy to maintain and has no special requirements. Temperature and pH ranges recorded in the natural habitat are 25.5-28° C and 7.0-7.8.

Breeding:. It will spawn in both pair and group situations. Pairs need to be similar-sized fish because the male is often very aggressive if the female is too small. Hatching time is 7-8 days at 26-27° C. Growth of the fry is rapid. They will reach about 3 cm in about four months if properly fed.

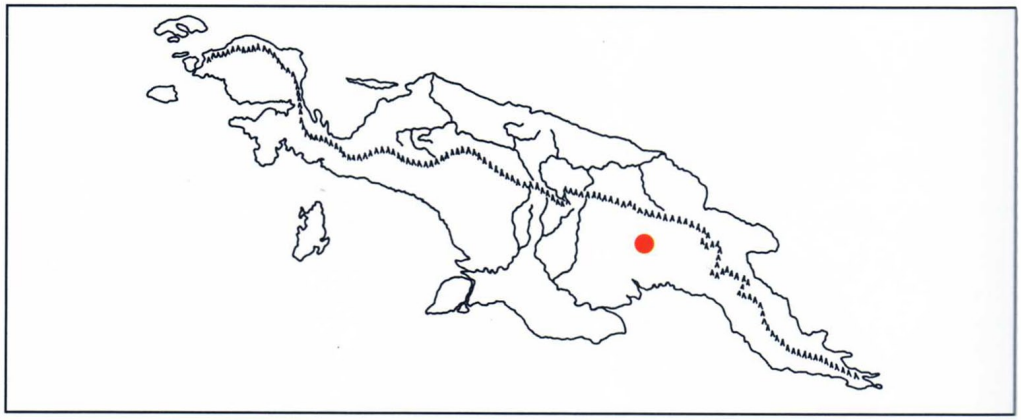
Distribution and Natural Habitat: *Melanotaenia goldiei* is one of the most widely distributed rainbowfishes in New Guinea. The range extends from the Port Moresby district of Papua New Guinea westward to about Etna Bay, Irian Jaya. It is also found at the Aru Islands. A wide range of habitats are occupied, including swamps, backwaters, small creeks, and large rivers. It is most frequently found in clear, rainforest streams.

Melanotaenia gouldiei

often in hilly terrain. The elevation ranges between about 100 and 1000 m. It is generally found in deeper pools, usually around log debris. It is sometimes found in the same streams with *M. papuae, M. splendida rubrostriata*, and *Pseudomugil novaeguineae.*

Status: It was first collected in the Goldie River near Port Moresby in the 1880's. Aquarium specimens were collected by the author in 1978 and during subsequent visits to the Port Moresby area over the next 5 years. The fish were shipped to Australia and bred by a number of hobbyists, but for one reason or another most of the captive stock seems to have disappeared over the past few years. It is now rare in the hobby. This is an unfortunate situation as the fish is very beautiful and has much to offer. Hopefully we will see more of it in the future. The species is very abundant and widespread in the natural habitat.

Habitat of *Melanotaenia gouldiei*, Nomad River, Papua New Guinea



Lake Tebera Rainbowfish

Melanotaenia herbertaxelrodi

ALLEN, 1981

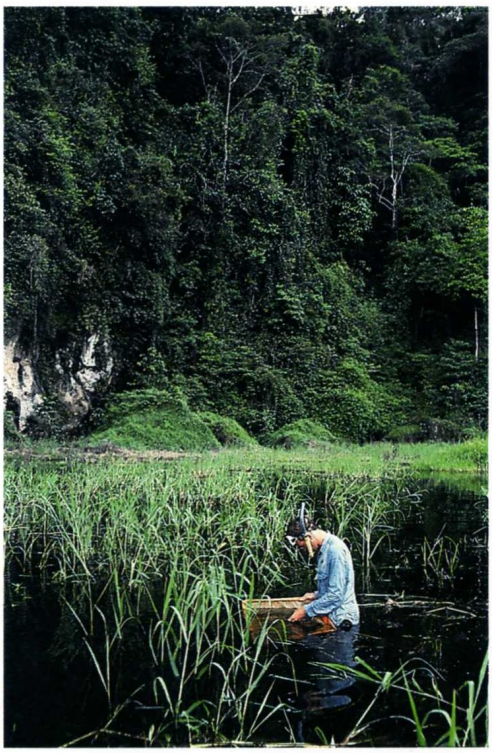
General features: A lake-dwelling rainbowfish from central Papua New Guinea, growing to at least 12-13 cm. It is mainly bright yellow with a bluish-black, mid-lateral stripe. The dorsal, anal, and caudal fins are red or yellow. Large males develop a very deep body. During courtship and spawning males flash a bluish or white stripe on the forehead.

Aquarium care: It is easy to maintain and has no special requirements. A well planted tank will maximise the colouration of the fish, as will frequent feedings of live food such as mosquito larvae and brine shrimp. Temperatures and pH in the natural habitat range between 21-24° C and 7.6-8.0. The stomach contents of wild-caught fish included filamentous green algae, parts of ants and beetle-like insects, and small pulpy fruits. In captivity it accepts a wide range of standard foods.

Melanotaenia herbertaxelrodi

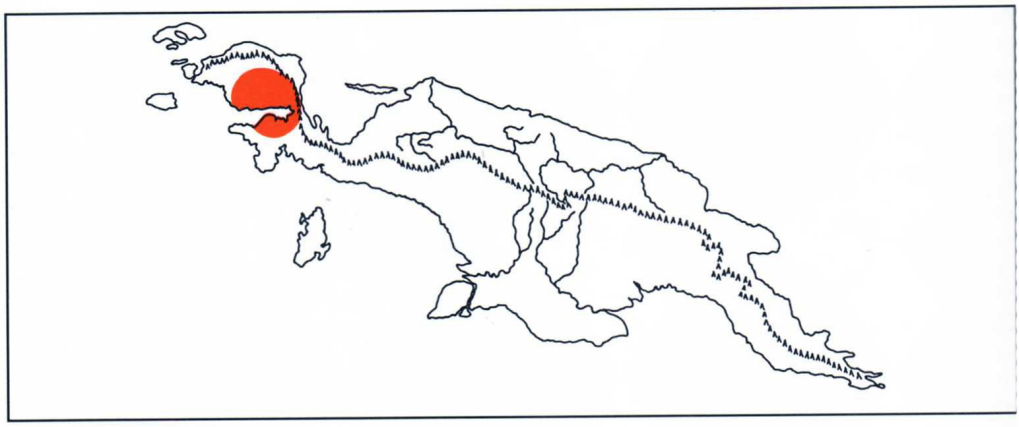
Breeding: This is one of the most prolific spawners of all rainbows. A group of 10-15 adults are capable of producing a very large number of fertilised eggs each day, which are deposited in either mops or Java moss. The eggs should be removed after spawning, at least every few days, to prevent the adults from eating them. Hatching occurs in about 7-10 days at 26° C. The young are easy to care for and can be started on a diet of "green water", powdered dry food, Liquifry, and vinegar eels, switching to baby brine shrimp after 2-3 weeks. Young fish begin to show the bright adult colours when they are about 4-5 cm or when they are approximately 9-10 months old.

Distribution and Natural Habitat: Known only from Lake Tebera and its feeder streams in the Southern Highlands of Papua New Guinea. The lake lies at an elevation of 800 metres above sea level and is surrounded by steep mountains that rise to an altitude of about 1500 metres. The lake is actually composed of numerous interconnected small and large ponds, swamps with tall grass, and crystal-clear springs that occupy a basin that is about 10 kilometres long and 2 kilometres wide. Seen in its natural habitat, this is easily one of the most spectacular rainbows. It is far more beautiful than even the most colourful captive specimens. In 1991 I visited the lake by helicopter and had an opportunity to swim there with a mask and snorkel. The pilot had a difficult time landing due to the scarcity of flat, dry ground, but eventually descended on sloping terrain near the shoreline. I entered the water in a 3-m diameter "blue hole", an incredibly clear 4 m-deep pool that drained into the center of the lake via a narrow 300 m-long channel. The Tebera rainbow was very abundant, both in the spring and channel. Courting males were everywhere, flashing brilliant neon hues in the sunlit waters. Not only was I astounded by their colouration, but their size was equally impressive, with many fish in excess of 12 cm. The fish were totally fearless and swarmed around me. This behaviour no doubt reflects the absence of large predatory fishes. The only other fishes there are a *Mogurnda* gudgeon and two species of *Glossogobius* gobies.



Habitat of *Melanotaenia herbertaxelrodi*, Lake Tebera, Papua New Guinea

Status: The species was first discovered in September 1980 by Brian PARKINSON and the author. The first live specimens were also collected on this same visit. Approximately 30 fish were brought to Australia and these formed the nucleus of the captive stock, thanks to initial breeding efforts of Melbourne aquarist Barry CROCKFORD. It has since been distributed to North America and Europe. It is very popular in the hobby, but due to the lack of influx of additional wild stock, hybridisation and in-breeding have become a problem. For example, I have noticed that the colours in my third and fourth generation fishes are much less radiant. The fish is very abundant at Lake Tebera and its future in the wild looks secure considering the remoteness of the habitat.



Irian Jaya Rainbowfish

Melanotaenia irianjaya

ALLEN, 1985

General features: A stream-dwelling rainbowfish from western Irian Jaya, growing to a size of about 11 cm. Mature fish are overall mauve with silvery reflections. There is a broad, bluish mid-lateral stripe, which is most prominent on the rear half of the body. The dorsal and anal fins are reddish with a narrow white margin. The caudal fin is also reddish and has distinctive black upper and lower margins. This species is unusual in having the middle rays of the dorsal and anal fins longer than the other rays, a feature generally associated with the genus *Glossolepis*.

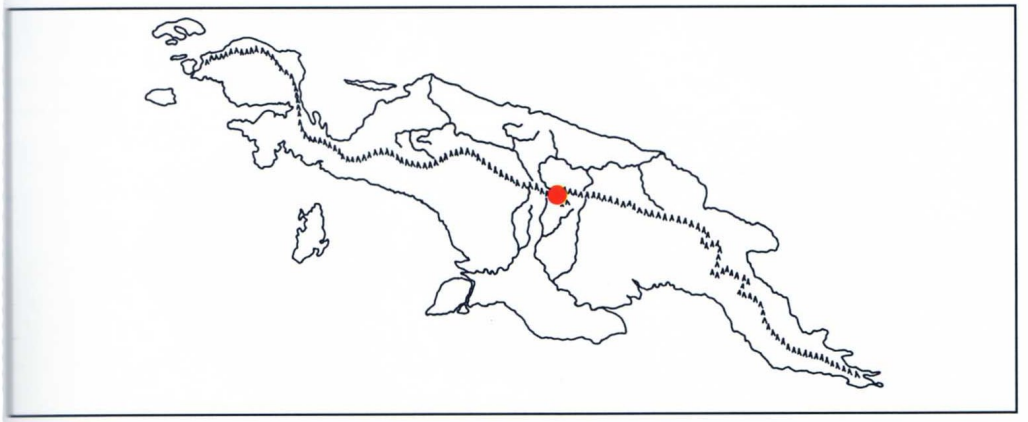
Aquarium care: An easy species to keep in captivity if given regular partial water changes, a temperature between 24 and 28° C, and pH range of 7.0-7.8. Hardness is not critical, at least for adults. A tank size of at least 150-200 litres is recommended, but pairs can be set up for spawning in a 40 litre tank. It is suitable for community tanks that contain other similar-sized rainbows. A wide variety of standard foods are acceptable.

Melanotaenia irianjaya

Breeding: The species readily spawns in captivity when either mops or Java moss is provided. The eggs hatch in about seven days at 26° C. Unlike nearly all other rainbows, the parents do not usually eat the eggs or newly hatched fry. Nevertheless, its best to separate the young due to their special feeding requirements. Growth is relatively slow - the young reach a length of about 4.5 cm in their first year.

Distribution and Natural Habitat: Found primarily in river systems that drain into Bintuni Bay (formerly Macleur Gulf) of Irian Jaya. This area encompasses the southern part of the Vogelkop Peninsula. It is also found on the Bomberai Peninsula, immediately south of the Vogelkop and across Bintuni Bay. Habitat conditions consist of rainforest streams ranging from slightly turbid and slow-flowing over flat terrain to clear, moderately fast-flowing through hills. Elevations range between about 30 and 500 metres. Temperature and pH values range from 27.0-28.3° C and 7.3-7.8 respectively. The fish are found in areas with relatively few aquatic plants, over gravel or sand bottom, often in the vicinity of submerged logs. Other fishes sharing this habitat include gudgeons *(Oxyeleotris)*, gobies *(Glossogobius)*, grunters *(Hephaestus)*, and halfbeaks *(Zenarchopterus)*.

Status: I first discovered this fish on a trip with Heiko BLEHER in 1982. We stopped briefly at Fruata Village while flying over the Bomberai Peninsula in a single engine aircraft. We had spotted a nearby stream from the air. We subsequently found the fish at several widespread sites on the Voglkop Peninsula. The species was introduced to the aquarium hobby in 1983. It is now relatively well established in Europe and America. It has been sold in England as *Melanotaenia waikiki*, a name that has no official status. Given its attractive colouration, unusual fin shape, and ease of breeding the species should become increasingly popular. It is very abundant and relatively widespread in the natural habitat.



Strickland Rainbowfish

Melanotaenia iris

ALLEN, 1987

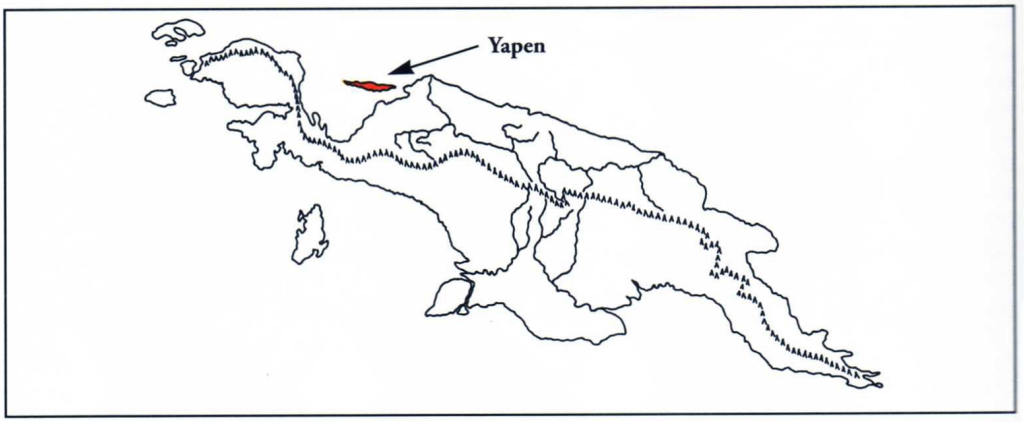
General features: A stream-dwelling rainbowfish from central-western Papua New Guinea, growing to at least 12 cm. Adult males are bluish on the upper back and white on the lower portion with a vivid dark blue stripe (about 2 scales wide) on the middle of the side. There is also a series of narrow, red-orange stripes between each longitudinal scale row on the upper half of the body, with those on the upper and lower margin of the blue mid-lateral stripe and one in the middle of the stripe particularly prominent. The live colours of the female are unknown.

Aquarium care: This species has not been maintained in captivity.

Breeding: No information, but probably typical of other *Melanotaenia* species.

Distribution and Natural Habitat: This species inhabits the upper tributaries of the Strickland River system in south-western Papua New Guinea. The Strickland is one of the major tributaries of the southward flowing Fly River. The fish were captured from boulder-bottom pools that were interspersed between shallow rapids. Other fishes at this site included a grunter (*Hephaestus trimaculatus*) and a gudgeon (*Mogurnda* sp.).

Status: It is only known on the basis of five specimens that were collected by Australian biologist D. GWYTHER during an environmental survey of the Strickland River system in 1984. The specimens were caught in the Logatyu River near Wankipe Village, with a baited hand line. The species is presently unknown to the hobby, and will likely remain this way due to the inaccessibility of its remote habitat.



Yapen Rainbowfish

Melanotaenia japenensis

ALLEN & CROSS, 1980

General features: A stream-dwelling species from Yapen Island, Irian Jaya, growing to at least 11 cm. Adults are mauve with silvery reflections on the back and sides. There is a red-orange horizontal stripe between each scale row on the body. Males have red-orange dorsal, anal, and caudal fins.

Aquarium care: This species is well suited for captivity. David PRICE, who does missionary work on Yapen Island, has successfully maintained them for several years. Feeding and general care is the same as for most rainbows. The natural temperature and pH ranges are 24-28° C and 7.2-7.8.

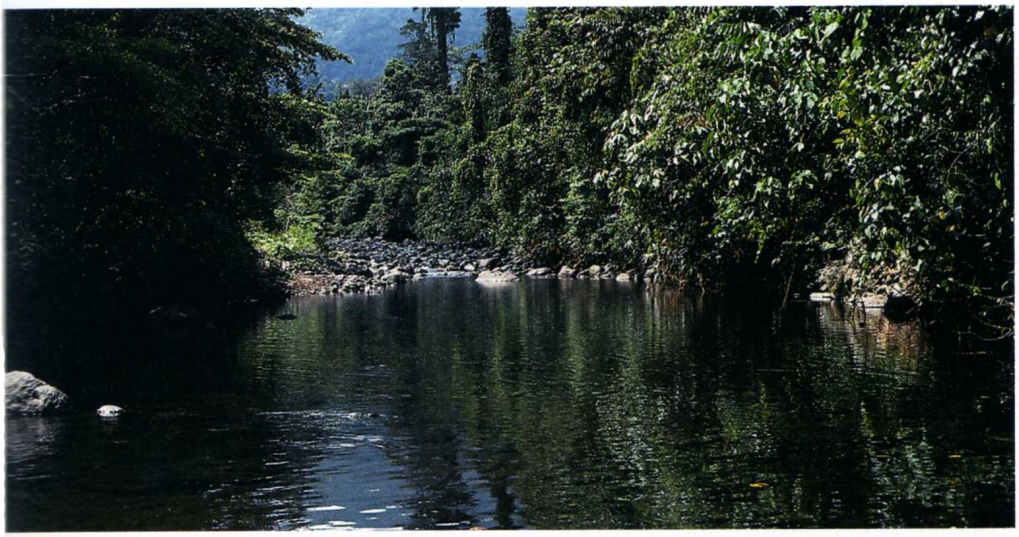
Breeding: No information, but probably typical of other *Melanotaenia* species.

Distribution and Natural Habitat: Known only from Yapen Island (sometimes spelled Japen), off northern Irian Jaya. Yapen is about 160 kilometres in length and about 20 kilometres wide. It is a mountainous island with peaks rising to about 1500 m. The central mountain range is drained by numerous rivers and creeks, which flow through luxurious rainforest. The fish inhabits lower elevations near the coast in clear, rocky streams. It shares this

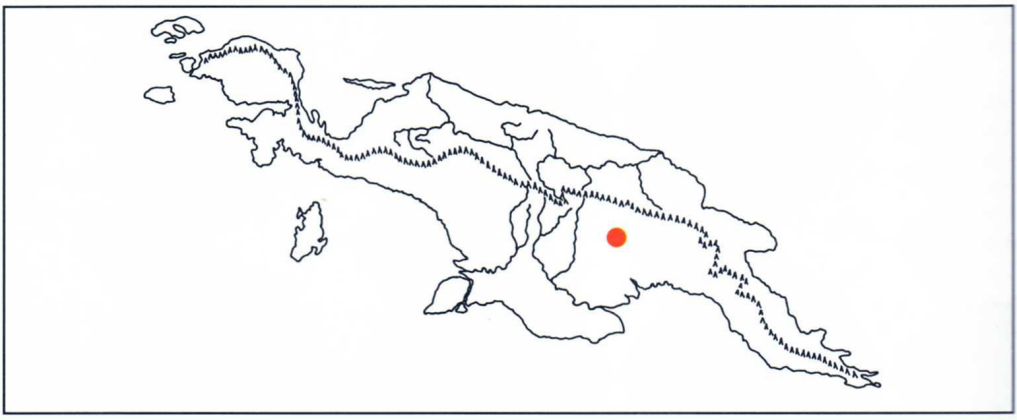
habitat with a still un-named species of *Chilatherina*.

Status: This species was first collected in May 1955 by Dr. M. BOESEMAN, former Curator of Fishes, at the Leiden Museum. It was not seen for nearly 35 years until David PRICE collected specimens for his aquarium, while doing missionary work on the island. It is still unknown in the hobby, but should prove to be popular once it is introduced. Large mature males in full colour are exceptionally attractive. Additional surveys are required to determine the population status. So far it has only been collected from two rivers on the southern side of Yapen. It was not very common at either site.

Melanotaenia japensis



Habitat of *Melanotaenia japensis*, Yapen Island, Irian Jaya



Lake Kutubu Rainbowfish

Melanotaenia lacustris

MUNRO, 1964

General features: A lake-dwelling rainbowfish from central Papua New Guinea, growing to about 12 cm. Adults are greenish to brilliant turquoise blue on the upper half, grading to white below. The scales on the back sometimes assume a golden sheen.

Aquarium care: It is easy to maintain in captivity and makes a stunning display. It has a peaceful disposition and is therefore suitable for a community tank. I prefer to keep it in a separate tank or with a few gudgeons. To simulate the natural habitat it is advisable to provide an abundance of

Melanotaenia lacustris

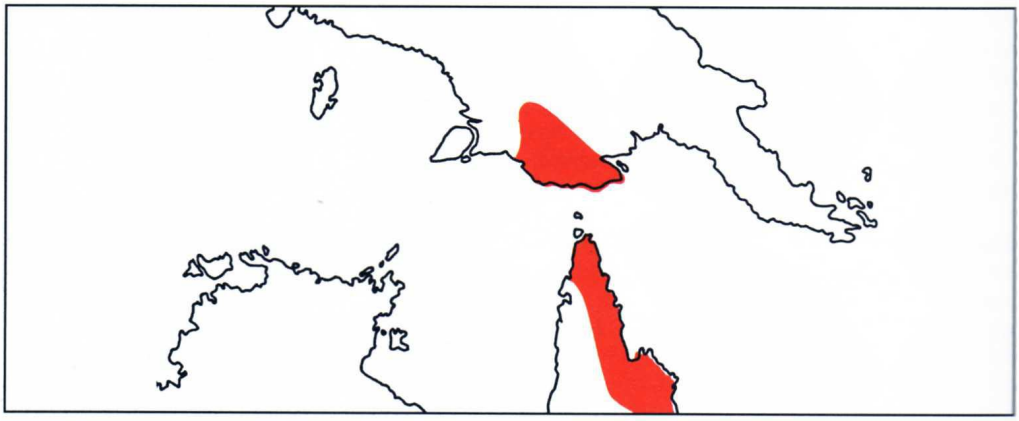
plants and some large rocks. It is not a fussy eater and will accept just about everything offered including a wide range of frozen, dry, and live foods. The natural temperature and pH ranges are 21-25° C and 8.5-9.0, but it can be successfully maintained and bred at ranges of 25-28° C and 7.0-7.5.

Breeding: It will spawn in either mops or Java moss. The mops or moss should be transferred to a separate tank when eggs appear or individual eggs can be hand-picked and placed in hatching trays. Hatching takes about 10-12 days at 24-25° C. The fry should be fed the usual diet of infusoria, powdered foods, vinegar eels, etc. After a week or two they are large enough to eat newly hatched brine shrimp. Growth is relatively slow, but the young mature within their first year at a length of about 5.5 cm.

Distribution and Natural Habitat: Known only from Lake Kutubu and its outlet, the Soro River, in the Southern Highlands of Papua New Guinea. This location forms part of the Kikori River system, which flows southward and empties into the Gulf of Papua. The lake is situated at an altitude of 800 m in hilly terrain, about 48 kilometres south of Mendi, the administrative centre of the Southern Highlands Province. It is set in a valley between low, parallel limestone ridges. The lake measures about 19 kilometres in length and 5 kilometres in width. It has a maximum depth of 65 m. Plant life is abundant with 16 species recorded, including members of *Ceratophyllum, Utricularia, Vallisneria, Pontederia, Bidens, Callitriche, Anacharis,* and *Potamogeton.* About every two years a phenomenon occurs known as "the turning of the waters". There is a massive upwelling of dark-coloured, oxygen-deficient bottom water, which results in large fish kills over a 3-day period. Most of the time the lake waters are very clear and ideal for snorkelling. Heiko BLEHER and I made underwater observations of the magnificent Kutubu rainbow in 1988. It was very common along the densely vegetated shallow margin and in the outlet stream. The fish sometimes formed shoals containing 50 or more individuals.

Habitat of *Melanotaenia lacustris*, Lake Katubu, Papua New Guinea

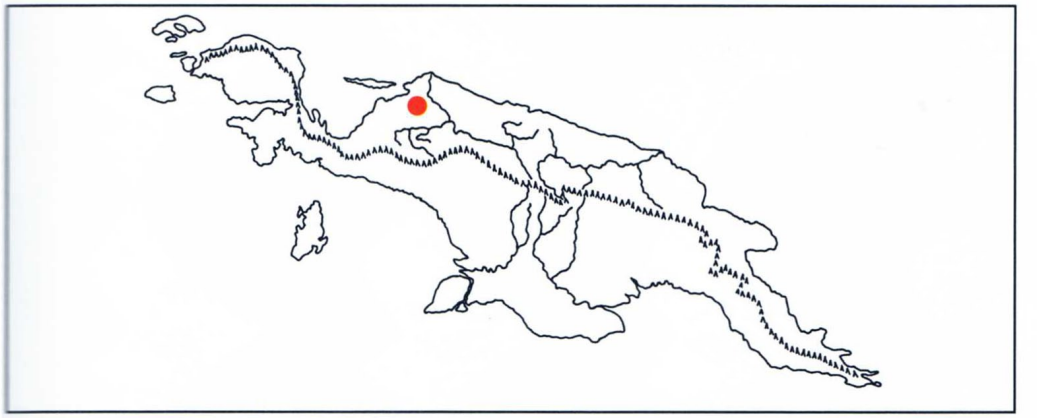
Status: The species was first discovered by Patrol Officer T. TERRELL in March 1955. The preserved specimens were sent to Ian MUNRO in Australia, who described it as a new species. It was not seen again until 1983 when live specimens were collected by Barry CROCKFORD, John PASKA, and the author. Most of the fishes perished during transport. Only four survived the trip back to Australia, and the only male died one week after arrival. Further specimens were obtained when Heiko BLEHER joined the author for a second visit in 1988. BLEHER transported about 70 fish back to Germany, which formed the nucleus of the present captive stock. The fish is now well established in the hobby worldwide and is one of the most popular species. It was very abundant at Lake Kutubu in 1988, but the population needs to be monitored. Nearby gas and oil fields have recently come into productions and the lake is now linked to Mendi by road. Only time will tell if these developments will have a negative impact. The lake's fish community is very unique and worthy of special conservation status. In addition to the rainbowfish, nine other fish species are unique to the lake, including five gudgeons in the genus *Mogurnda.* There is no other lake in New Guinea, which is home to so many endemic species.



Macculloch's Rainbowfish
Melanotaenia maccullochi
OGILBY, 1980

This species occurs in both Australia and New Guinea. Coverage is provided in the section dealing with Australian rainbowfishes on page 56.

Melanotaenia maccullochi



Mayland's Rainbowfish

Melanotaenia maylandi

ALLEN, 1982

General features: A stream-dwelling fish, from the Mamberamo region of Irian Jaya, growing to a length of at least 13 cm. Adult males are generally olive green or brown on the back and silvery white on the lower side. The upper back and sides often reflect bluish or mauve hues and there is a series of narrow orange stripes on the side between each horizontal row of scales. There is also a very diffuse bluish mid-lateral stripe punctuated with 1-6 large blotches.

Aquarium care: This species does well in aquarium conditions, and its care is similar to other rainbows.

Breeding: There is no information, but probably similar to other rainbows, especially *M. affinis*, which is a close relative.

Distribution and Natural Habitat: So far this species has only been collected in a single small creek, one m wide, about 2 kilometres upstream from Danau Bira

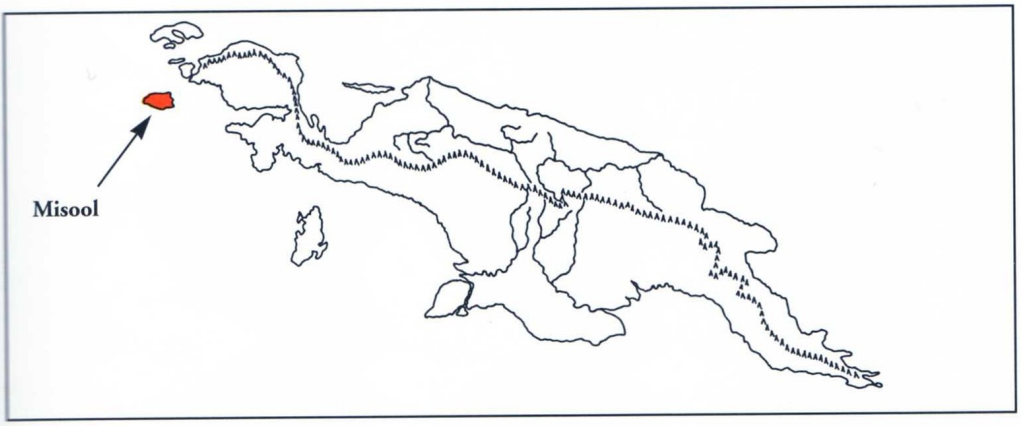
Melanotaenia maylandi

Melanotaenia maylandi

Habitat of *Melanotaenia maylandi*, near Lake Holmes, Irian Jaya

(Lake Holmes) in the lower Mamberamo system of Irian Jaya. David PRICE, who resided at Lake Holmes for several years, looked for this species unsuccessfully in other nearby streams. The habitat is situated in dense, closed-canopy rainforest. Fish were confined to deeper (to 0.5 m), rocky pools.

Status: This fish was discovered by Heiko BLEHER and the author during a visit to Irian Jaya in 1982. Unfortunately, no live specimens for the aquarium were collected and it has never been introduced to the aquarium hobby. However, David PRICE kept it in his aquarium at Lake Holmes, and reported the species was easily maintained. It must obviously be more widespread and further surveys are required to delineate its distribution. This may prove difficult as the area is very remote, and beyond the immediate vicinity of Lake Holmes travel is exceedingly difficult due to the dense jungle.



Misool Rainbowfish

Melanotaenia misoolensis

ALLEN, 1982

General features: A stream-dwelling rainbowfish from Misool and Batanta islands, Irian Jaya, growing to at least 8 cm. Adult fish are mainly yellow with a broad blue-black mid-lateral stripe and whitish belly. It is similar in appearance to *M. herbertaxelrodi.*

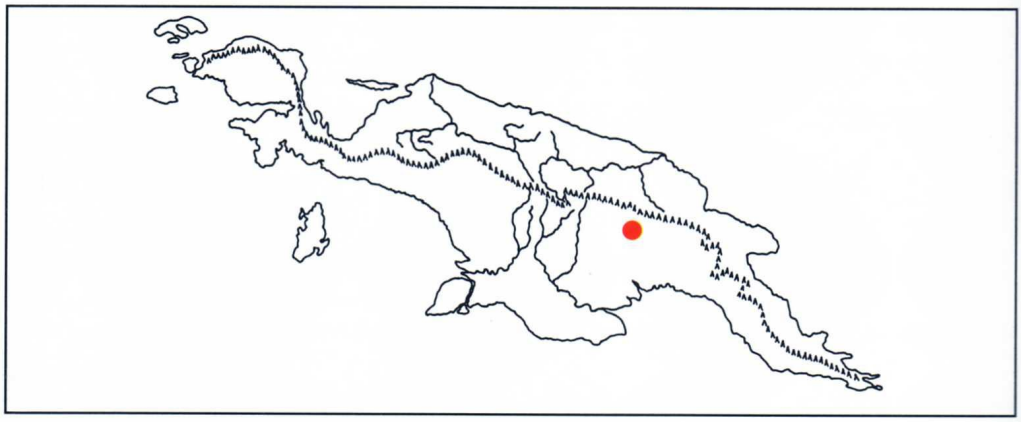
Aquarium care: This is a peaceful fish well suited for a community tank or can be kept alone in schools. It tolerates a wide range of conditions including temperatures of 22-28°C, pH between 6.0-8.5, and GH 1-30.

Melanotaenia misoolensis

Breeding: Typical for *Melanotaenia.* It spawns readily in mops or Java moss. Eggs should be removed to a nursery tank for hatching.

Distribution and Natural Habitat: Known only from the offshore islands of Misool and Batanta. Misool lies about 70 kilometres south-west of the Vogelkop Peninsula. Batanta is 85 kilometres north of Misool and about 40 kilometres west of Sorong. The habitat consists of clear jungle streams.

Status: It was first collected in October 1948 from a tributary of the Tama River near Fakal Village on Misool Island by M.A. LIEFTINCK. However, the species was not officially described until 1982, shortly after I discovered Lieftinck's specimens at the Leiden Museum. The first aquarium specimens were collected at Batanta and exported to Germany by Heiko BLEHER in 1992. It is still relatively unknown in the hobby, but it is gradually gaining popularity. It is a colourful fish with excellent potential.



Mountain Rainbowfish

Melanotaenia monticola

ALLEN, 1980

General features: A stream-dwelling fish, from Papua New Guinea, growing to a length of about 10 cm, although fish longer than 10 cm are rare. Adults are generally greenish to dusky blue grey on the back with broad margins of coppery gold on the scales. There is a prominent black mid-lateral stripe. Males have an attractive mauve colour on the breast and pectoral fin region. The dorsal, anal, and caudal fins are translucent yellowish.

Aquarium care: This species does well in aquarium conditions, which is surprising considering its rather specialised habitat. It can tolerate cooler temperatures (17-23° C) compared to most other rainbowfishes, but seems to thrive equally well at higher temperatures. Optimum colours are achieved if the fish are provided with plenty of plants, good aeration, a temperature between 20-25° C, and pH of 7.5-8.0.

Breeding: They readily spawn in captivity in temperatures as low as 15° C. However, the best results are achieved if the water is maintained between about 20°-25°C. When sexually aroused, the males show incredibly intense coloration. The coppery-gold scale edges are particularly vivid and the upper part of the head and body becomes very dark. The courtship display is enhanced by a vibrant, pulsing orange colour that is flashed on top of the forehead. Mops or Java moss containing eggs should be removed daily and placed in a separate hatching container. The incubation period lasts about 10-12 days at 24° C. Care of the young is similar to that recommended for other *Melanotaenia.*

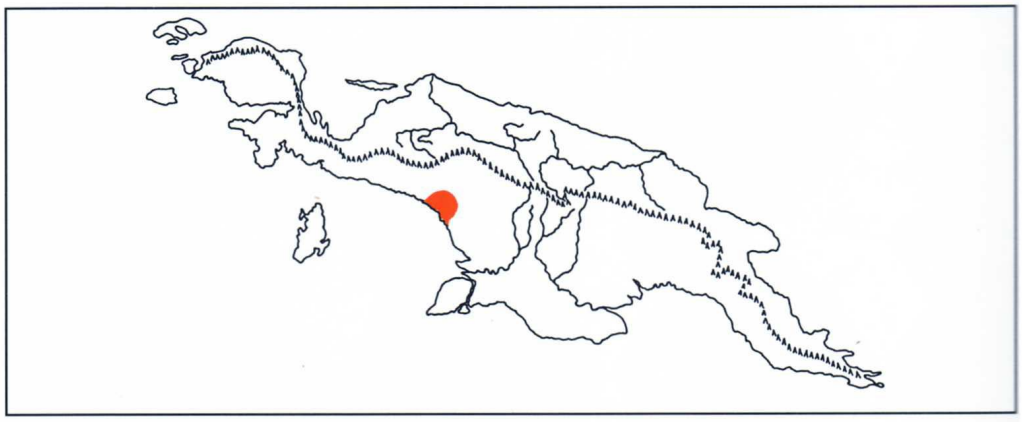
Distribution and Natural Habitat: It occurs in the upper Purari and Kikori river systems

Melanotaenia monticola

Habitat of *Melanotaenia monticola*, Omei Creek at Mendi, Papua New Guinea

in the Southern Highlands of Papua New Guinea, approximately in the area between Mendi and Lake Kutubu. It has the distinction of living at a higher altitude than any other rainbow, ranging from about 790 m to 1600 m above sea level. The habitat consists of clear, relatively swift-flowing creeks in mountainous terrain. The fish congregate in the slower-flowing sections, next to grassy banks. These sites generaly lack aquatic vegetation, but eggs are deposited among the submerged roots of terrestrial plants. Temperature and pH values of 18.6° C and 7.8 were recorded at one of the sites.

Status: Live specimens were first collected and transported to Australia by the author and Barry CROCKFORD in 1983. Small numbers are now present in the hobby, mainly in Australia and North America. Further surveys are required to evaluate the status of the wild population. The only confirmed reports of this species are from Omei Creek (about 15 kilometres south of Mendi), the upper Mubi river near Pimaga (about 13 kilometres south-east of Lake Kutubu), and creeks flowing into Lake Kutubu in the vicinity of Moro.



Ogilby's Rainbowfish

Melanotaenia ogilbyi

WEBER, 1910

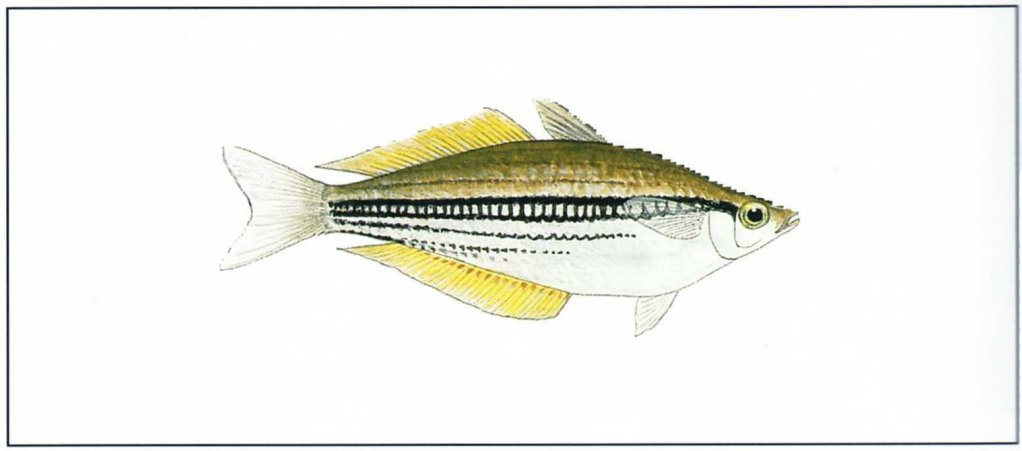
General features: A stream-dwelling rainbowfish from south-eastern Irian Jaya, growing to about 7-8 cm. Live colours are unknown, but it is probably similar to *M. papuae*, except the pair of dark stripes running along the middle of the body are more intense, and may sometimes merge to form a single broad band.

Aquarium care: This species has not been maintained in captivity.

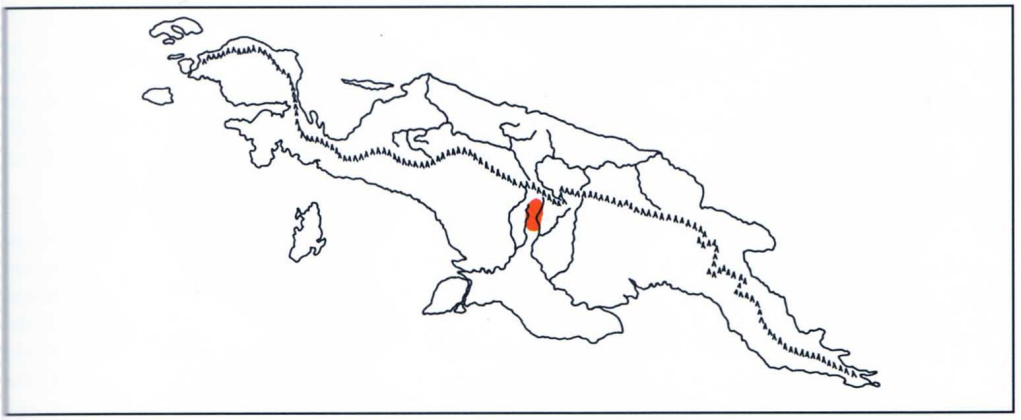
Breeding: No information.

Distribution and Natural Habitat: Known only from the Lorentz River, one of the major southward flowing water courses of Irian Jaya. The only precise locality is the vicinity of Sabang, which is situated well upstream, about 120 kilometres inland. There is little habitat information except that it occurs in *Pandanus* swamps along the margin of the river.

Status: The species was first discovered in May 1907 by the Dutch explorer Dr. H. LORENTZ. Only seven specimens were collected and it has not been seen since. It is probably common, but this part of Irian Jaya remains largely unexplored by biologists.



Melanotaenia ogilbyi



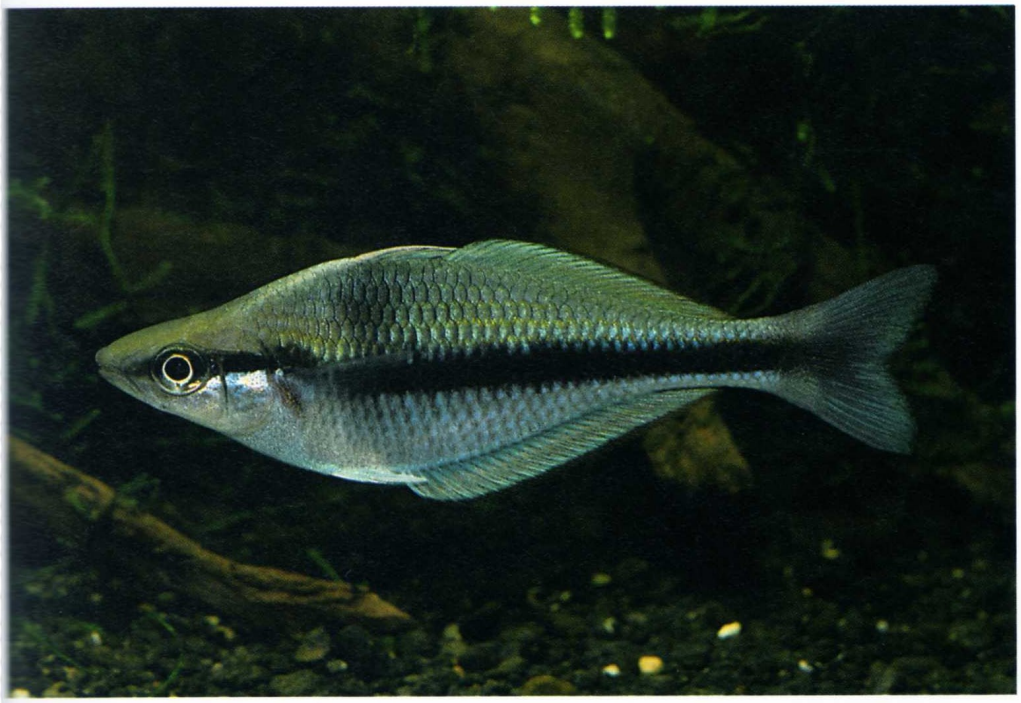
Oktedi Rainbowfish

Melanotaenia oktediensis

ALLEN & CROSS, 1980

General features: A stream-dwelling species from central-western Papua New Guinea, growing to 12 cm. It is coppery brown on the back and pale mauve to white on the lower half with a prominent black mid-lateral stripe.

Aquarium care: This species is easy to maintain. It lives in cool, relatively fast mountain streams and therefore a slightly lower temperature (22-24° C) and stronger



Melanotaenia oktediensis

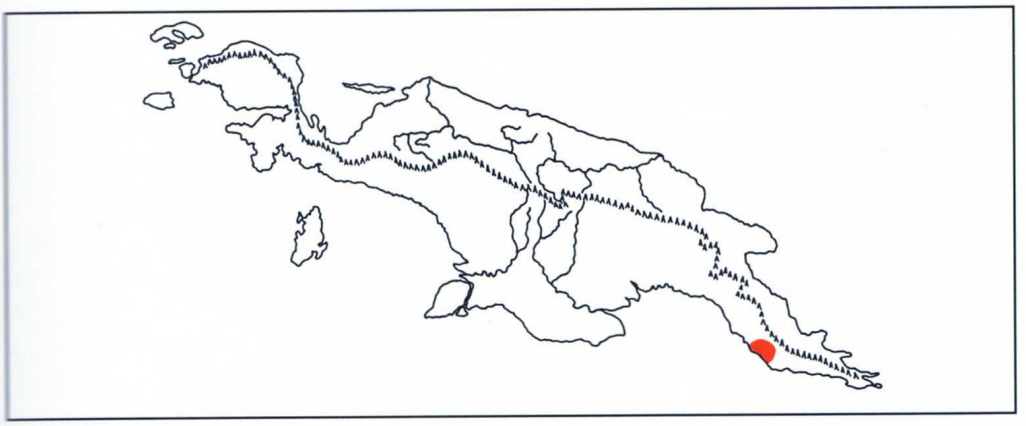
than average aeration is advisable. The natural diet consists largely of algae and ants. In captivity it will eat a range of frozen and dried foods, but for maximum colouration and conditioning occasional feedings of live daphnia, mosquito larvae, brine shrimp, and vegetable matter should be provided.

Breeding: Spawning generally occurs early in the morning. It will spawn in mops or Java moss. Eggs are 1.3-1.4 mm diameter and hatch in 14-15 days at 21-23° C. Care of the young is similar to that recommended for other rainbows.

Distribution and Natural Habitat: This species occurs in the Ok Tedi River and its tributaries. It is uncommon in the main river, which is populated with *M. splendida rubrostriata,* but is common in the small, swift-flowing tributaries. The Ok Tedi is one of the main headwater streams of the Upper Fly River system. Most specimens have been collected near Tabubil, approximately 900-950 kilometres upstream from the sea in mountainous terrain between 300-500 m above sea level. The habitat consists of clear, rainforest creeks with rocky bottoms. Temperatures range from 17-24° C and pH is 7.3-8.7.

Status: It was first discovered by Dr. Tyson ROBERTS during an ichthyological survey of the Fly River system during 1975. It was introduced to the Australian aquarium hobby about eight years later. It is now firmly established in the hobby thanks to the efforts of ANGFA member Ron BOWMAN, who specialised in breeding it. Breeding stocks in North America and Europe were started from eggs that were mailed overseas by Mr. BOWMAN. The species continues to thrive in the wild, although it is restricted mainly to tributaries. The population in the Ok Tedi River has probably been reduced by the disposal of mine tailings, which contain cyanides and copper.

Habitat of *Melanotaenia oktediensis,* Ok Tedi River, Papua New Guinea



Papuan Rainbowfish

Melanotaenia papuae

ALLEN, 1980

General features: A stream-dwelling rainbowfish from south-eastern Papua New Guinea, growing to about 7.5-8 cm. It is olive on the back with yellow hues, grading to white on the lower half. There is a series of narrow black stripes (one per scale row) on the lower half of the body, with the uppermost more vivid than the others. The posterior portion of the middle dark stripes is often red or orange. The fins are pale yellow.

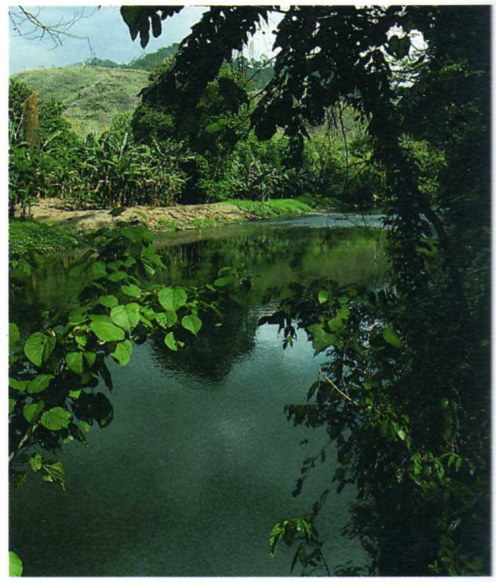
Aquarium care: This is an excellent aquarium species that is easily maintained. Five or six fish can be kept in a 35-40 litre tank. It has a very peaceful disposition and is therefore suitable for a community tank. The natural temperature and pH ranges are 25.5-30° C and 7.2-7.8.

Breeding: It spawns readily in captivity in either mops or Java moss.

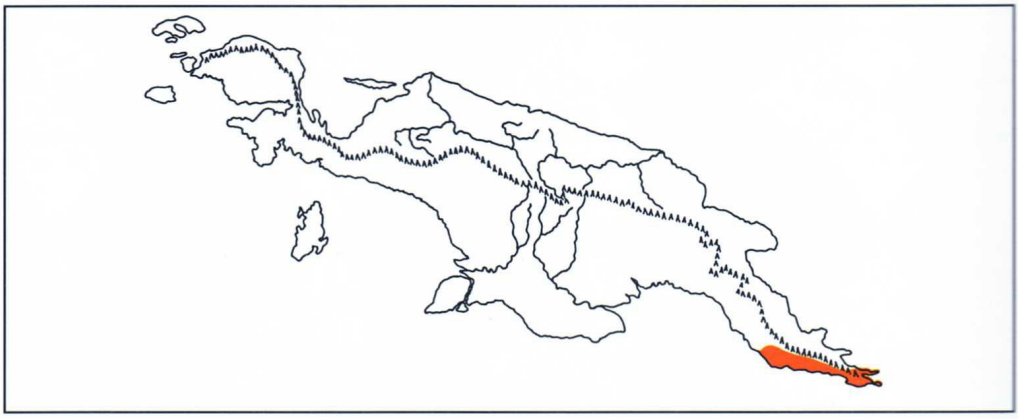
Melanotaenia papuae

Distribution and Natural Habitat: The full extent of its geographic ranges remains undetermined. Most specimens have been collected from streams within a 35-kilometres radius of Port Moresby, the capital city of Papua New Guinea. It occurs in streams that flow through dense jungle with mud and detritus bottoms, and also in open savanna country close to the coast with mud or gravel bottoms. The habitat consists mainly of streams near the coast, but it is also present on the Sogeri Plateau at an elevation of about 600 m. In many places it co-occurs with *M. goldiei.*

Status: The first aquarium specimens were brought to Australia by the author in 1978. Several other shipments over the next 5-8 years contributed to the present breeding stock. The species is now well established in the hobby worldwide. Its natural habitat lies close to Port Moresby in an area where environmental destruction poses a serious threat.



Habitat of *Melanotaenia papuae*, at Port Moresby, Papua New Guinea



Parkinson's Rainbowfish

Melanotaenia parkinsoni

ALLEN, 1980

General features: A stream-dwelling rainbowfish from south-eastern Papua New Guinea, growing to at least 13 cm. It is olive to brown on the back and silvery blue on the sides with a narrow orange stripe between each scale row. The fins of adult males are bright orange. Males sometimes have extensive orange colouration on the sides, obliterating the orange stripes between the scale rows.

Aquarium care: It is easy to maintain and has no special requirements. Due to its large size it should be provided with plenty of space. For example, a 350-litre tank is suitable for about 15 adult fish. Temperatures and pH in the natural habitat range between 27-30° C and 7.6-7.8. In the wild it eats mainly insects that fall onto the

Melanotaenia parkinsoni

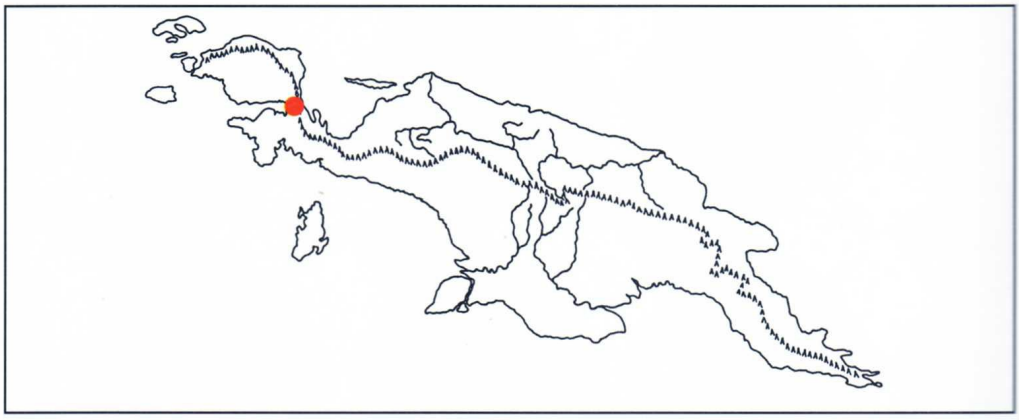
surface and filamentous algae, therefore live food and vegetable matter should be included in the diet.

Breeding: It spawns readily in captivity in either mops or Java moss. The eggs should be removed after spawning otherwise the adults will eat them. Hatching occurs in about 8-10 days at 27° C. The young attain sexual maturity in the first year at about 5.5-6.5 cm length.

Distribution and Natural Habitat: The species is widely distributed in some coastal streams between Port Moresby and Milne Bay in south-eastern Papua New Guinea. Relatively little collecting has been done in this area and it is only known from a few scattered locations. Most of the original specimens, including the first live stock sent to Australia, were taken from a small stream that was mainly dry except for occasional isolated pools. The stream was situated in grass plain habitat with patchy rainforest immediately adjacent to the creek. The specimens were netted from a pool measuring 5 x 12 m with a maximum depth of 2 m. The pool was heavily littered with logs and branches, and the water was very turbid.

Status: The species was first discovered in 1978 by the author in a tributary of the Kemp Welsh River, about 75 kilometres south-east of Port Moresby. Live specimens were also collected at this time and transported to Australia. It is now established in the hobby worldwide, but in relatively low numbers. Hopefully it will become more readily available in the near future. When fully mature, the orange-finned males are very spectacular. There is very little information concerning the status of wild populations as it mainly occurs in an area where access is very poor.

Habitat of *Melanotaenia papuae*, at Port Moresby, Papua New Guinea



Lake Kurumoi Rainbowfish

Melanotaenia parva

ALLEN, 1990

General features: A lake-dwelling rainbowfish from western Irian Jaya, growing to about 6 cm. Mature fish are highly variable in colour. Males are either bluish to mauve with a black mid-lateral stripe or silvery with red speckling and narrow red stripes between each scale row on the side of the body. Females are less vivid. Fins of both varieties are red.

Aquarium care: This species has not been maintained in captivity.

Breeding: No information, but is probably typical of other *Melanotaenia* species.

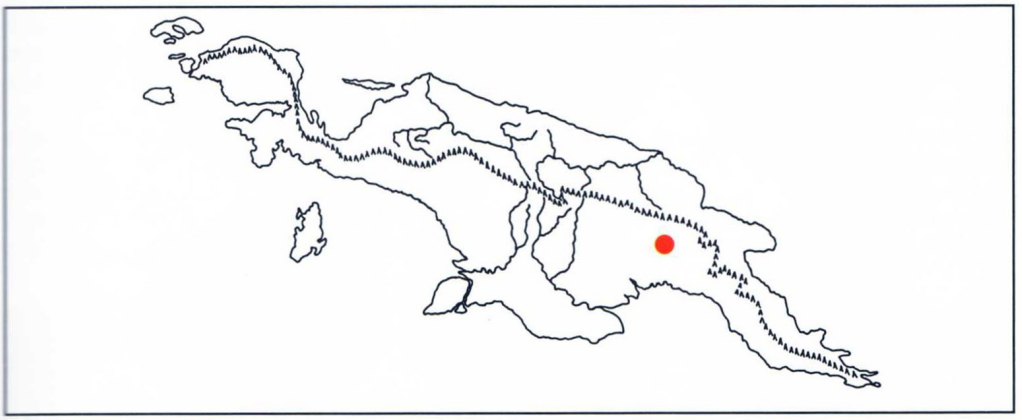
Distribution and Natural Habitat: Known only from tiny Lake Kurumoi, situated in the narrowest part of Irian Jaya, the isthmus separating the Vogelkop Peninsula and the remainder of Irian Jaya. The lake is only about 500 metres wide and 800 metres long. There are no water chemistry data. I discovered the fish during an expedition to nearby Bintuni Bay in 1989. It required nearly two days of travel in a motorised canoe and an additional day and a half of walking to reach the lake, which is situated in mountainous terrain. The water level of the lake was very low at the time of our visit. There were vast expanses of dried

Melanotaenia parva

mud and dead vegetation along the shoreline. The water was very turbid and some sections had prolific growth of pond weed *(Ceratophyllum demersum)*. Lake Kurumoi is part of the Yakati River system, but the water level of the lake is now well below the former outlet, and there is no apparent drainage. Other fish present included the gudgeon, *Oxyeleotris fimbriata*, and the African cichlid, *Oreochromis mossambica*. This isolated occurrence of the African fish is an enigma. It was probably introduced during the Dutch colonial period. The nearest village is a one-day walk away on the east coast.

Status: The species occurs in a very remote section of Irian Jaya and is yet to be introduced to the hobby. It is unlikely to make an appearance in the foreseeable future. Conservation management is advisable in view of the very limited distribution. Also the presence of *Oreochromis*, presents a threat to the lake habitat. Their nesting and feeding activities probably contribute to high turbidity levels.

Habitat of *Melanotaenia parva*, Lake Kurumoi, Irian Jaya



Pima Rainbowfish

Melanotaenia pimaensis

ALLEN, 1981

General features: A stream-dwelling rainbowfish from central Papua New Guinea, growing to at least 9 cm. It is olive to brown on the back and silvery blue on the sides with a narrow orange stripe between each scale row. Adults have a prominent blackish mid-lateral stripe.

Aquarium care: It is unknown in the hobby. The author kept them in captivity for several months in 1980-81 and no difficulties were encountered, until an accident with the aquarium heater resulted in the loss of all specimens.

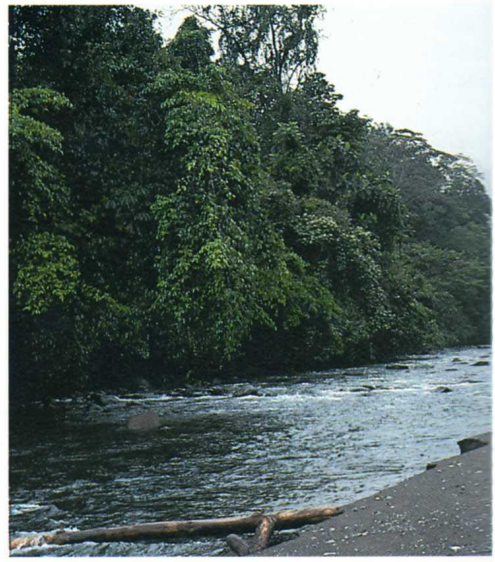
Breeding: There is no information, but probably similar to *M. affinis* and *M. goldiei*, which are closely related species.

Distribution and Natural Habitat: The species occurs in rivers and creeks in the

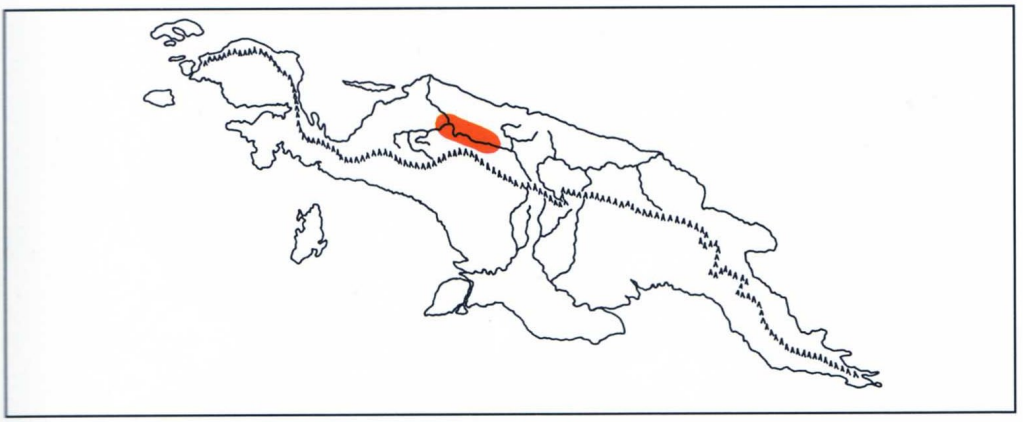
Melanotaenia pimaensis

headwaters of the Purari River system of central Papua New Guinea. This is one of the most scenic and remote sections of Papua New Guinea. Although the area is inadequately surveyed, the Pima rainbow is thus far known only from the area immediately to the north and east of Lake Kutubu, in the Pio and Tua rivers and their tributaries. This region is very mountainous and largely inaccessible except by helicopter. The mountain peaks rise to elevations of 3000 m, but the fish are confined to the lower valleys at about 700-1000 m. Streams are lined with rainforest and are relatively fast flowing with intermittent rapids and low waterfalls. The fish congregate along the banks where currents are slower or in relatively still backwaters.

Status: The species was first discovered in 1980 by Brian PARKINSON and the author in the Pima River. We landed briefly during a helicopter flight to Lake Kutubu. A few live specimens were captured and transported back to Australia. Unfortunately they died in captivity after a few months due to a heater malfunction. There have been no subsequent collections of live material. I was able to revisit the natural habitat in 1991, once again via helicopter, but only obtained specimens for museum preservation. I sampled at three locations in tributaries of the Pio River. The fish was very abundant at each site.



Habitat of *Melanotaenia pimaensis*, Pima River, Papua New Guinea



Dwarf Neon Rainbowfish

Melanotaenia praecox

(WEBER & DE BEAUFORT, 1910)

General features: A stream-dwelling rainbowfish from the Mamberamo region of Irian Jaya, growing to about 5-6 cm. Adults are bright neon blue with red dorsal, anal, and caudal fins.

Aquarium care: This is a very peaceful fish that can be kept separately or in a community tank with other non-aggressive species. Schools of 10-20 fish make a dazzling display. The fish will show the best possible colours if the aquarium is well planted. It is easy to care for and does not have any special requirements. The recommended temperature and pH ranges are 24-27° C and 6.5-7.0 respectively.

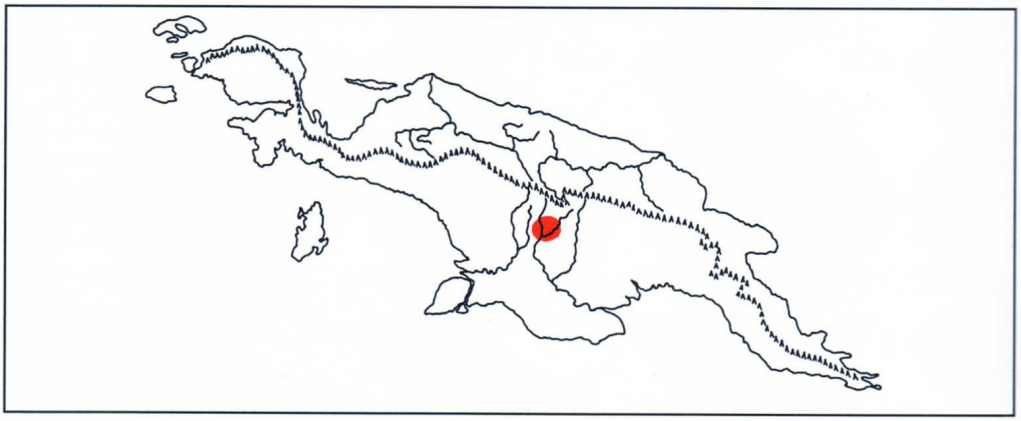
Breeding: It is a prolific spawner. If the tank has an abundant supply of Java moss and other plants, and provided the adults are well fed, the eggs and subsequent fry can remain in the same tank. Otherwise the eggs can be transferred to a separate nursery tank. The hatching time is about 10-12 days at 26° C. Care and feeding of the young is the same for other *Melanotaenia*. They begin to show the typical blue colouration between 2-3 cm total length.

Melanotaenia praecox

Distribution and Natural Habitat: Known from clear, swift-flowing streams near the airstrips at Dabra and Iritoi on the edge of the Mamberamo Plains. The temperature and pH in the Dabra stream were 27.8° C and 6.5 respectively.

Status: It was first discovered by Dutch naturalists in 1910. They collected 31 specimens from a tributary of the Mamberamo River, but failed to record any colour notes. It therefore came as a great surprise when I saw this fish alive for the first time in 1991. Aquarium specimens were captured and exported one year later by Heiko BLEHER. It is quickly becoming established in the aquarium hobby worldwide, thanks to Mr. BLEHER'S efforts. Its small size, brilliant colouration, and ease of breeding combine to make it an excellent fish for both advanced and beginning aquarists. The Mamberamo region remains poorly surveyed and the distributional limits of this species are unknown. The only reliable localities thus far are Dabra and Iritoi.

Habitat of *Melanotaenia praecox*, Iritoi, Irian Jaya



Fly River Rainbowfish

Melanotaenia sexlineata

MUNRO, 1964

General features: A stream-dwelling rainbowfish from south-western Papua New Guinea, growing to about 7.5 cm. It is golden yellow or greenish bronze with narrow blackish stripes between each scale row. An intense horizontal black mark is located directly behind the upper pectoral fin base.

Aquarium care: This is an excellent aquarium species. Due to its small size, a breeding colony of five or six fish can be kept in a 35-40 litre tank. Although its native streams are usually acidic it does very well in captivity if maintained in neutral to slightly alkaline conditions (pH 7.0-7.5). Water changes (20-30 percent) are recommended every two weeks.

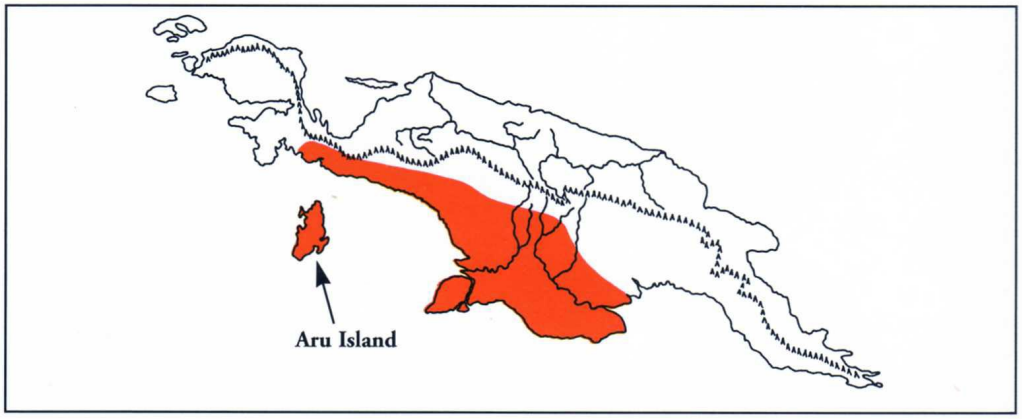
Melanotaenia sexlineata

Breeding: It spawns readily in captivity in either mops or Java moss. Egg laying occurs daily. The incubation period lasts 7-10 days . The fry are relatively small for rainbowfish, but will attain about 2-3 cm after about six month. An infusoria culture prepared with banana skins is a good starter food for the first week. They will then accept vinegar eels, newly hatched brine shrimp, and powdered food.

Distribution and Natural Habitat: The full extent of its geographic ranges remains undetermined. It is presently known only from a few sites in the upper Fly River system near the town of Kiunga, which is approximately 830 kilometres upstream from the sea. Most specimens have been collected from creeks immediately north of Kiunga along a 50-kilometre stretch of the Tabubil Road. It is flat rainforest habitat with elevations below 100 m, but close to the foothills. The streams are small, slow-flowing, and clear, but darkly stained (similar to tea in appearance). The pH ranges between 6.1-6.5.

Status: It was first collected in 1937 from a tributary of the upper Fly River by Lt. Stuart CAMPBELL. The official scientific description was not published until 1964 by the Australian ichthyologist Ian MUNRO. The first aquarium specimens were brought to Australia by the author in 1982. Thanks to the breeding efforts of Melbourne aquarists Neil ARMSTRONG and Barry CROCKFORD the species is now established in the hobby worldwide. Although further surveys are required it appears to be abundant in the natural habitat.

Habitat of *Melanotaenia sexlineata*, Fly River, Papua New Guinea



Red-striped Rainbowfish

Melanotaenia splendida rubrostriata

(RAMSAY & OGILBY, 1886)

General features: A stream-dwelling rainbowfish from southern New Guinea, growing to about 15 cm. The colour is overall pale bluish-grey, grading to white on the lower sides. Each horizontal scale row is separated by a narrow orange to salmon pink stripe. The membranes between the rays of the second dorsal and anal fins are wine red.

Aquarium care: Identical to that described for *M. splendida australis* in the previous chapter.

Breeding: Identical to that described for *M. splendida australis* in the previous chapter.

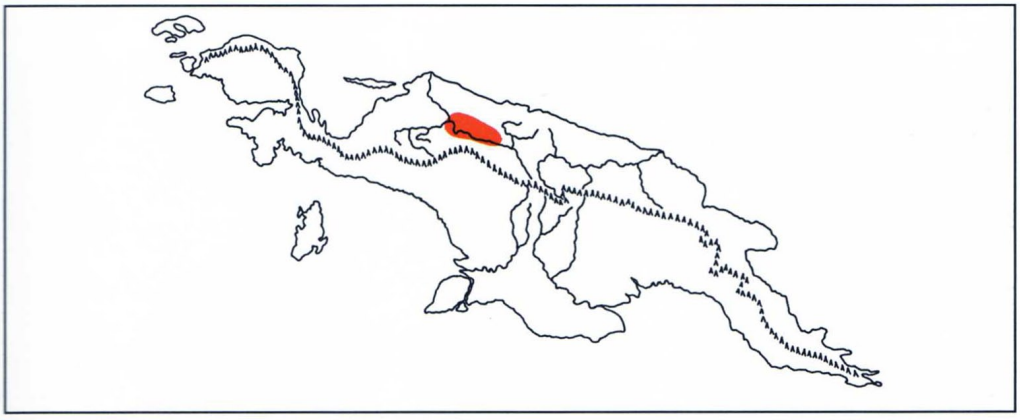
Distribution and Natural Habitat: It is one of the three most widely distributed rainbows in New Guinea, along with *M. affinis* and *M. goldiei*. It occurs south of the central dividing range between the Aramia River (near the Fly River) of Papua New Guinea westward to Etna Bay, Irian Jaya. It is also present at the Aru Islands. Lowland, coastal plain is the usual habitat. It is found in tributaries of the larger rivers in clear or turbid water. It is often abundant in densely vegetated margins of streams, lagoons, and shallow lakes. It also

Melanotaenia splendida rubrostriata

thrives in artificial impoundments. I found large numbers in a small reservoir on the island of Darra and in flooded gravel pits north of Kiunga that resulted from the construction of Tabubil Road. The temperature and pH ranges recorded in the natural habitat are 25-30° C and 5.6-7.4.

Status: It was first collected at the Strickland River, Papua New Guinea in the 1880's by a man named Froggatt, a member of an expedition sponsored by the Geographical Society of Australasia. Live specimens were shipped to Australia by the author between 1978-1982, which formed the basis of captive stock in that country. There are still a few fish being kept by Australian hobbyists, but the species has been largely ignored. It is far less popular than the much easier to obtain subspecies of *M. splendida* found in Australia. This is unfortunate as it is a magnificent fish, especially when large males are showing full colouration. It's reintroduction into the hobby would be very worthwhile. The species is very abundant and widespread in the wild.

Habitat of *Melanotaenia splendida rubrostriata*, central Fly River, Papua New Guinea



Van Heurn's Rainbowfish

Melanotaenia vanheurni

(WEBER & DE BEAUFORT, 1922)

General features: A stream-dwelling rainbowfish from the Mamberamo region of Irian Jaya, growing to nearly 20 cm. It is the largest member of the family. Adults are brown or olive on the back and yellow on the lower sides. There is a prominent blue-black, mid-lateral stripe with a relatively broad pale yellow to white stripe along its upper and lower margin. Aroused males display a pulsing glow of golden yellow on top of the head.

Aquarium care: There is little information. David PRICE, a missionary working in Irian Jaya, has successfully maintained the species without problems. Adults require more space than normal due to their large size. It appears to be a peaceful species that is suitable for a community tank. David PRICE keeps this fish with a variety of other rainbows and gudgeons.

Breeding: No information, but probably similar to that of other *Melanotaenia.*

Distribution and Natural Habitat: It occurs in small creeks and larger tributaries in the Mamberamo Basin of northern Irian Jaya. It is not found in large turbid rivers such as the Mamberamo and its major tributaries, but instead prefers clear streams flowing through rainforest, mainly close to foothills around the periphery of the extensive Mamberamo Plains. It is very abundant in slow to relatively swift-flowing streams with rock and sandy bottoms. It shares this habitat with *Chilatherina fasciata.* Temperature and pH values range between 25-28° C and 7.1-7.5.

Habitat of *Melanotaenia vanheurni*, Mamberamo System, Irian Jaya

Status: The species was first discovered in the Mamberamo Valley by the Dutch zoologist and explorer W. C. VAN HEURN in 1920. It was not seen again until David PRICE collected it 70 years later. The fish is actually abundant, but occurs in a remote, seldom-visited area. It has not been introduced to the aquarium hobby, although live specimens may have been imported to Germany in 1992 by Heiko BLEHER. It is a very attractive fish, but will probably not gain wide acceptance among hobbyists due to its relatively large size.

Melanotaenia vanheurni

Blue-eyes of Australia and New Guinea

Introducing Blue-eyes

The Blue-eyes are small, often colourful fishes that inhabit fresh, brackish, and marine waters in Australia and New Guinea. Until recently they were included in the same family with rainbowfishes, but a comprehensive study by SAEED, IVANTSOFF, and ALLEN, published in 1989, furnished strong evidence for separate recognition of this group. Fifteen species are presently recognised, but others will not doubt be discovered in the near future, particularly in New Guinea.

Blue-eyes are often found in the same environment as rainbowfishes, although they do not usually penetrate as far inland. Streams and swamps within about 20-30 kilometres of the sea and coastal mangroves, in brackish to fully marine conditions, are the most common habitats. These fishes are strictly lowland dwellers; all except the recently described Red-finned Blue-eye *(Scaturiginichthys vermeilipinnis)* from central-western Queensland are found below an elevation of about 100 m. Paskai's Blue-eye (*Pseudomugil paskai*) of the upper Fly River penetrates exceptionally far inland (more than 800 km), but nevertheless is found below 100 m.

The Australian distribution of the family encompasses most the east coast southward to about 35°20'S latitude. It also occurs sporadically along the northern coast, most commonly in the Northern Territory and along the western side of Cape York Peninsula. The Red-finned Blue-eye, which is found in an artesian

Pseudomugil paludicola

basin near Longreach, Queensland, represents an isolated inland population. Although further surveys are required, the New Guinean distribution is mainly restricted to the southern portion between the Fly River and Vogelkop Peninsula. The only species not conforming with this pattern is the Cape Blue-eye *(Pseduomugil majusculus),* which occurs at the far eastern end of Papua New Guinea.

Blue-eyes taxonomy

It was already mentioned that Blue-eyes are now a separate family, known as the Pseudomugilidae. The family takes its name from the original or "type" genus *Pseudomugil,* which was described by KNER in 1865. The family is related to rainbowfishes and several other families that are members of the order Atheriniformes. The characters used to separate Blue-eyes from other atheriniform fishes are mainly skeletal features, particularly those related to the presence or absence, and shape of various skull bones. For example, the Blue-eye family is the only atheriniform group that lacks the mesethmoid, a small bone found on the snout region. Aside from the obvious size and shape differences, Blue-eyes differ from rainbowfishes in lacking rigid spines in the dorsal and anal fins. A summary of the overall classification of the family is presented below:

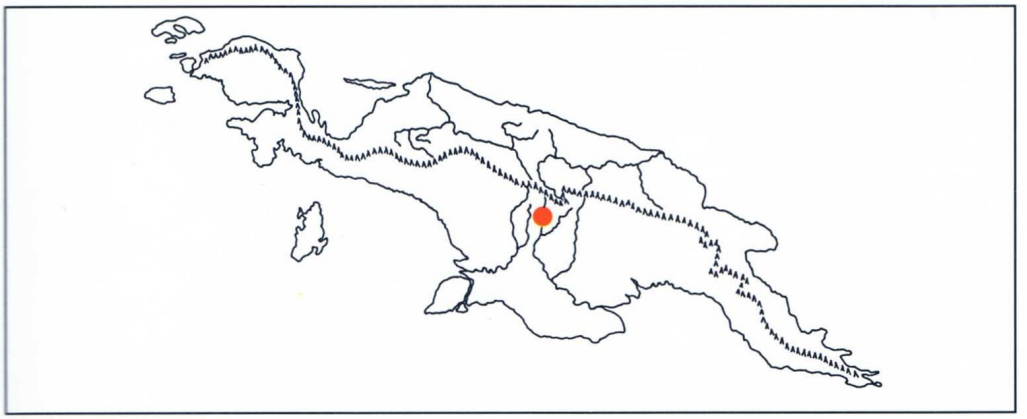
Order:	Atheriniformes
Family:	Pseudomugilidae
Subfamily:	Pseudomugilinae
Genus:	*Pseudomugil*
Subgenus:	*Pseudomugil* (13 species)
Subfamily:	Kiungainae
Genus:	*Kiunga* (1 species)
Subfamily:	Scaturiginichthyinae
Genus:	*Scaturiginichthys* (1 species)

The genus *Popondetta* was described in 1980 to accommodate the closely related *P. connieae* and *P. furcatus.* It was subsequently discovered that the name *Popondetta* was preoccupied by a genus of beetles that was described a few years earlier. Therefore, I proposed a substitute name, *Popondicthhys,* in 1987. However, it was eventually decided that this genus was not distinctive enough to be separated from other *Pseudomugil.* Mention should also be made here of *Pseudomugil helodes,* a species described by IVANTSOFF and ALLEN in 1984 from Irian Jaya. Further study of this species indicated that it was not a true Blue-eye and actually belonged to an undescribed genus in the family Telmatherinidae. The genus was eventually named *Kalyptatherina.*

Pseudomugil gertrudae

Pseudomugil furcatus

Species section



Kiunga Blue-eye

Kiunga ballochi

ALLEN, 1983

General features: A stream-dwelling Blue-eye from south-western Papua New Guinea, growing to about 3 cm. The colour is mainly semi-transparent with fine, dark scale outlines on the back. The fins are clear except for a prominent black margin on the dorsal, anal, and caudal fins. These same fins also have bright yellow submarginal bands, and there is a large patch of yellow covering the front half of the anal fin. The first dorsal fin is very tiny; it is difficult to see without the aid of a microscope.

Aquarium care: There is very little information. It is susceptible to handling-induced shock and is therefore a delicate species to transport. Once it is settled in a well-planted tank it should be relatively easy to care for.

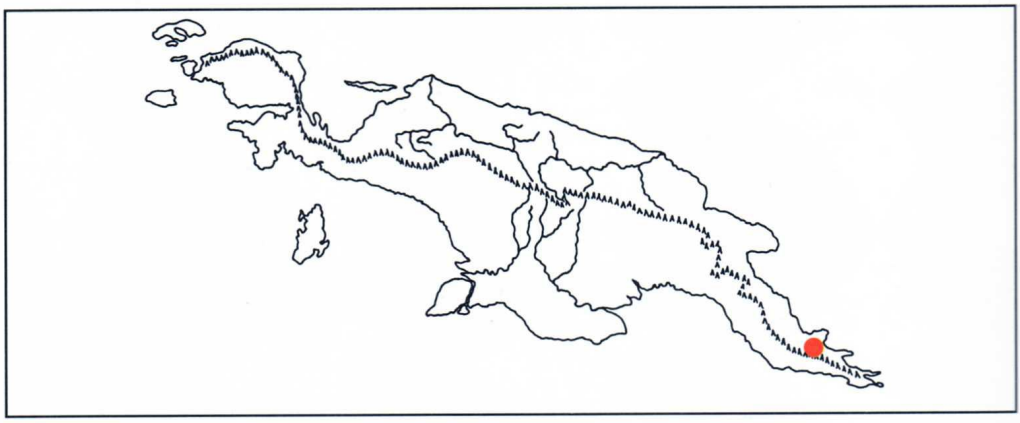
Breeding: There is no information for this species, but spawning habits are probably similar to other Blue-eyes.

Kiunga ballochi

Distribution and Natural Habitat: The full extent of its geographic ranges remains undetermined. It is presently known only from a few sites in the upper Fly River system near Kiunga. Most specimens have been collected from tributaries of the Ok Smak River, approximately 30-40 kilometres north of Kiunga or approximately 900 kilometres upstream from the mouth of the Fly River. These streams cross the road leading to Tabubil in the section between the villages of Rumginae and Ningerum. The Ok Smak is a tributary of the Ok Mart River, which flows into the Ok Tedi River, one of the main headwaters of the Fly. This area is only 24 kilometres east of the Irian Jaya border. The habitat is in flat rainforest terrain, at an elevation of only 80 m above sea level. The clear, shallow streams are well-shaded, but have occasional open patches exposed to sunlight. A temperature of 24.5° C and pH of 7.8 were recorded. The fish occurs in large aggregations. *Pseudomugil novaeguinae* was found in the same streams.

Status: The species was discovered in September 1982 by John PASKA and the author. A few live specimens were shipped to Australia, but they did not survive for more than a few weeks. The fish has not been seen in the wild since 1982. More survey work is required to accurately determine its abundance and geographic range.

Note: Charley NISHIHIRA, a Honolulu aquarist, visited the Upper Fly region in search of this fish in 1994. He was unsuccessful, but surprisingly found a new species of *Kiunga*. It was found about 19 kilometres from the town of Kiunga on the road leading to Kokonda. The new species is similar to *K. ballochi*, but has much shorter dorsal and anal fins. It also differs in having unbranched fin rays (branched in *K. ballochi)* in the dorsal and anal fins. This species will soon be described and given a scientific name by the author.



Popondetta Rainbowfish

Pseudomugil connieae

(ALLEN, 1981)

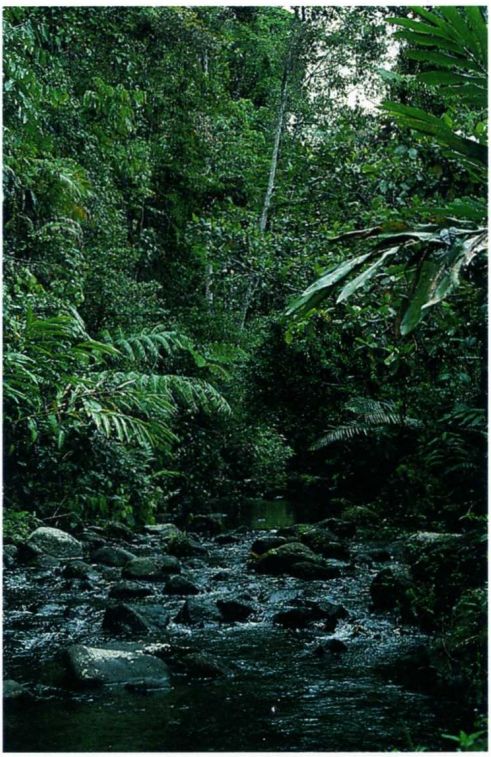
General features: A stream-dwelling Blue-eye from eastern Papua New Guinea, growing to about 6 cm, but usually only 4 - 5 cm. The colour is grey or olive on the back and whitish or semi-transparent on the lower half with a dusky mid-lateral stripe. Adults males usually have a yellowish breast and a thin yellow stripe along the lower edge of the body. The fin coloration, particularly of males, is very distinctive. There is a prominent black stripe on the basal half of the anal and both dorsal fins, and the middle caudal-fin rays are also blackish. The outer half of the dorsal fins and the lobes of the caudal fin are yellow. The first dorsal fin of adult males is elongate with a filamentous tip.

Pseudomugil connieae

Aquarium care: It is highly recommended as an aquarium fish. Due to its small size, it should be kept alone or with similar-sized fishes with a peaceful disposition. Smaller species of Blue-eyes such as *P. gertrudae* and *P. paskai*, or *Iriatherina*, are ideal tankmates. The tank should be at least 40 litres and well planted, including some floating type vegetation. One or twice daily feedings of live baby brine shrimp or similar-sized live food, and finely pulverised dry food such as Tetramin, are recommended. Stomach contents of wild-caught fish indicate a diet consisting primarily of tiny crustaceans and insect larvae, plus a small amount of green algae. The natural pH and temperature ranges are 7.7-7.9 and 24-27° C.

Breeding: It will readily spawn in a well planted tank that is supplied with dense clumps of Java moss. A relatively bare spawning tank, measuring approximately 38x25x25, can also be utilised. A thin layer of sand, either floating mops or a clump of Java moss, a slow-bubbling airstone, and 2-3 rafts of *Riccia* (a floating plant) will provide the proper environment. The water depth should be about 15-20 cm. Either group or pair spawning may be attempted with this set-up. It may be necessary to try several different pairings until a compatible couple are found. Another female should be substituted if the male is overly aggressive, otherwise injury will result and spawning may not occur. During courtship the male rapidly darts around the tank displaying it erected dorsal, anal, and pelvic fins. Spawning usually occurs in the morning. Only a few eggs are deposited each day. The incubation period last 15-20 days at about 25-28° C. The eggs and fry can be left in the same tank with the parents or transferred to a separate rearing container. The fry will accept initial feedings of a protozoan culture and powdered dry food. When properly cared for the growth is fairly rapid. The young are old enough to spawn after only 3-4 months.

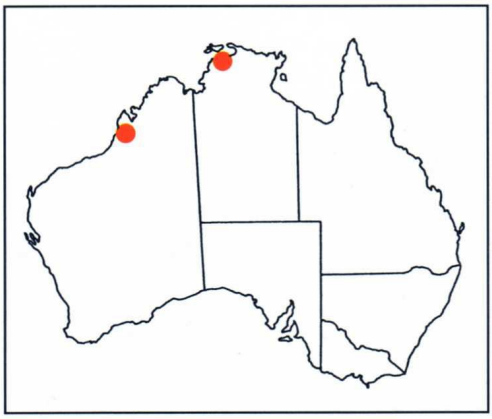
Distribution and Natural Habitat: It is found only within a 25 kilometres radius of Popondetta, eastern Papua New Guinea.



Habitat of *Pseudomugil connieae*, near Popondetta, Papua New Guinea

The area, situated a short distance inland from the Solomon Sea, is primarily a lowland river plain dissected by numerous meandering streams. Much of the area is virgin rainforest, but there are also large patches of cleared grassland. Most fish have been collected in small, relatively swift-flowing tributaries in very clear water.

Status: The species was first collected in 1978 by Brian PARKINSON and the author. Several live fish from these collections were shipped to Australia. Thanks to the initial breeding efforts of Melbourne aquarist Barry CROCKFORD and several other ANGFA members, the fish became established in the Australian hobby. Eggs were eventually sent to hobbyists in Europe and North America. It is now fairly well established in the hobby worldwide, but not in great numbers. An influx of new wild-caught fish is badly needed to revitalise captive stock. The fish was abundant in several streams near Popondetta in the late 70's and early 80's, but additional surveys are required to assess the current status of the population.



Blueback Blue-eye

Pseudomugil cyanodorsalis

ALLEN & SARTI, 1983

General features: A marine and estuarine species from Western Australia and the Northern Territory, not exceeding about 2.8-3.0 cm. The colour is mainly semi-transparent with clear fins. Males have a neon blue back and dark anterior edges on the yellowish second dorsal and anal fins. The upper edge of the pectoral fin is also dark. The gill cover and pectoral region are yellowish or brassy orange. During courtship and spawning these colours are greatly intensified and very spectacular.

Aquarium care: This is a marine estuarine species and therefore must be maintained in partial salt water. They can tolerate a wide range of salinities from nearly fresh to about 40 ppt sea water, but fish will live longer if maintained in brackish conditions. In practical terms, the species can be maintained in an aquarium that has between one-third and one-half sea water. Commercial marine aquarium salt preparations can also be utilised to achieve this mixture. A large amount of shell grit placed over an undergravel filters will maintain a high water quality. A 30-litre tank is sufficient for a group of up to 20 adults. Because of the salt water it is not possible to keep plants in the aquarium; instead it can be decorated with rocks and driftwood. It is advisable to keep a cover on the tank as the fish may jump when alarmed. A weekly water change of 15-20 percent of the total quantity is recommended. Live foods such as mosquito larvae and brine shrimp should be provided regularly, but most standard frozen and dry foods are usually eaten.

Breeding: Bruce HANSEN of Brisbane, Australia has successfully bred this species. Heuses a liberal number of nylon mops suspended from styrofoam floats at each end of the tank. Light brown mops are pre-

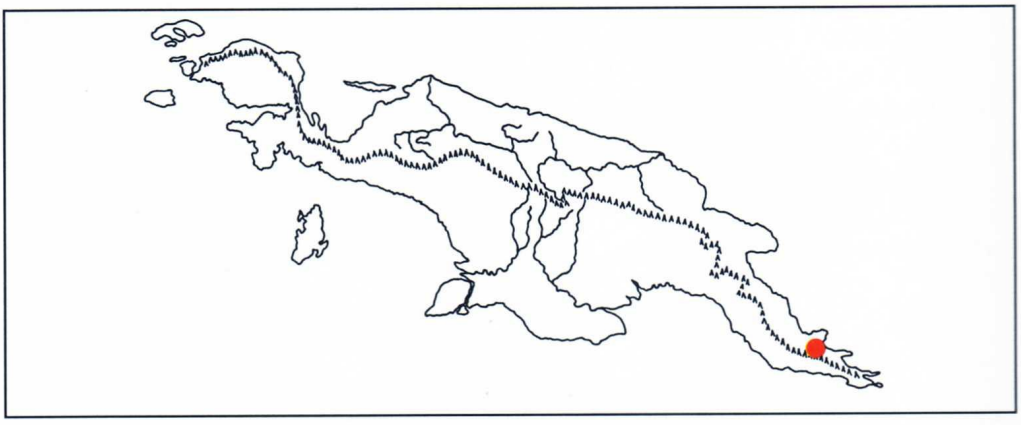
ferred as they yield far more eggs than darker ones. Spawning usually takes place in the morning, but can also be triggered by water changes. Each female lays 2-12 eggs each day. The egg-laden mops should be gathered each day or at least every few days, and placed in a separate hatching container. HANSEN divides his breeding tank into two compartments so the eggs and subsequent fry can be kept in the same water as the parents. Hatching time is about 15 days depending on the temperature. Newly hatched fry will accept a combination of banana skin infusoria, egg yolk infusion, micro-worms, and powdered dry food. The young grow to a length of 1 cm in about 6-8 weeks, and can be sexed about two weeks later.

Distribution and Natural Habitat: It is presently known from coastal mangroves in the vicinity of Broome and Wyndham, Western Australia and Darwin, Northern Territory, but is probably more widespread. Broome specimens were captured in a salt water creek bordered with mangroves. The water depth at this locality is influenced by huge tides and varies from a few cm to 3-4 m. During the month of July a water temperature of 22° C and salinity of 40 ppt were recorded.

Pseudomugil cyanodorsalis

Status: The species was first collected in 1981 by Helen LARSON, Curator of Fishes at the Northern Territory Museum in Darwin. It was found a year later at Broome and a number of live specimens were collected by Neil SARTI and the author. Further aquarium stock was collected around Darwin by Ray LEGGETT in 1986. It is still relatively unknown outside of Australia. The species is very abundant in the natural habitat. The author has observed thousands of fish at Crab Creek near Broome and in small tidal creeks at Darwin.

Habitat of *Pseudomugil cyanodorsalis*, Crab Creek near Broome, Western Australia



Forktail Blue-eye

Pseudomugil furcatus

NICHOLS, 1955

General features: A stream-dwelling Blue-eye from eastern Papua New Guinea, growing to about 6 cm, but usually only 4-5 cm. It is similar in colour to *P. connieae*, except the black stripes are missing on the dorsal and anal fins, and the margins of these fins are yellow rather than white. Other differences include the yellow pelvic fins, yellow upper edge on the pectoral fins, and narrow black upper and lower margins on the caudal fin. The first dorsal fin of adult males is elongate with a filamentous tip.

Pseudomugil furcatus

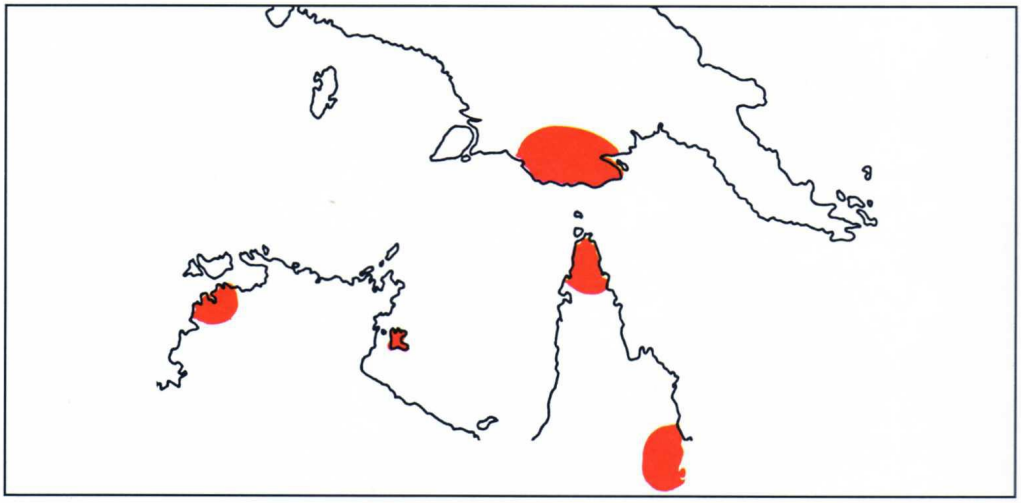
Aquarium care: Similar to that recommended for *P. connieae.*

Breeding: Identical to the closely related *P. connieae.*

Distribution and Natural Habitat: The habitat is situated in lowlands of eastern Papua New Guinea between Dyke Ackland and Collingwood bays. It has only been recorded from near the village of Pumani (about 15 kilometres inland from Collingwood Bay) and at Safia in the Musa River Valley (about 56 kilometres inland from Dyke Ackland Bay). At the latter area it was collected from clear, rainforest streams with abundant aquatic vegetation. Temperature and pH readings of 25° C and 7.6 were recorded.

Status: The species was first collected in 1953 from Peria Creek near Pumani Village by H. M. VAN DEUSEN of the American Museum of Natural History's Archbold Expedition. It was not seen again until 1981 when Barry CROCKFORD and the author collected it at Safia. Live specimens were shipped to Australia and initial breeding attempts by Barry CROCKFORD were successful. Eggs were eventually shipped to Europe and North America and the fish is now widely available internationally. Knowledge of distribution and population numbers is very incomplete. It was abundant in rainforest streams in the vicinity of Safia in 1982.

Habitat of *Pseudomugil furcatus*, Crab Creek near Broome, Western Australia



Spotted Blue-eye

Pseudomugil gertrudae

WEBER, 1911

General features: A stream-dwelling Blue-eye from northern Australia and southern New Guinea, growing to about 3.8 cm. The general colour is whitish, sometimes showing a golden sheen, with a network of narrow, dark scale outlines. The dorsal, anal, and caudal fins are yellow with numerous small black spots. The middle rays of the first dorsal fin and anterior rays of the pelvic fins are elongated in adult males.

Aquarium care: It is a very peaceful fish, but due to the small size it is best to keep them in a separate aquarium. A tank size of 20 litres or larger is suitable. The species

Pseudomugil gertrudae

exhibits a very wide tolerance to acid conditions, and can be maintained at a pH ranging from 3.8 to 7.8. Readings in the wild generally range between 5.2-6.7. The recommended range for aquarium maintenance is 6.0-7.0 and the temperature should be between 23-28° C.

Breeding: It will readily spawn in captivity. Groups of 10-15 fish containing a ratio of 2-3 females per male can be set up in a 28-40 litre tank. Some aquarists prefer to use acidic (pH 5.5-6.9) water, which is achieved by adding a small handful of boiled peat moss to the tank and adding occasional aged tap water to maintain a constant pH. Others have good success using alkaline water (pH 7.0-7.5). A proper diet is important to stimulate spawning. This means avoiding the exclusive use of dry flakes. Live or frozen foods should be offered daily, as well as a good quality flake. Satisfactory live foods include baby brine shrimp, mosquito larvae, and chopped tubifex. Courting males vigorously chase females and frequently erect the dorsal and anal fins. Spawning often occurs in late morning or early afternoon. Eggs are deposited within about 10 cm of the bottom. Therefore, if mops are used it is best to drop the water level to at least 15-20 cm depth. A thick mat of Java moss will also work well, and it is not necessary to lower the water level if it is placed near the bottom. Females deposit 1-3 tiny eggs at a time and may shed up to about 10 eggs per day. Fry will usually survive in a well planted tank, but if they fail to appear after about two weeks, then it is a good idea to closely examine the Java moss or mops for eggs, transferring any that are found to a separate hatching container. Hatching

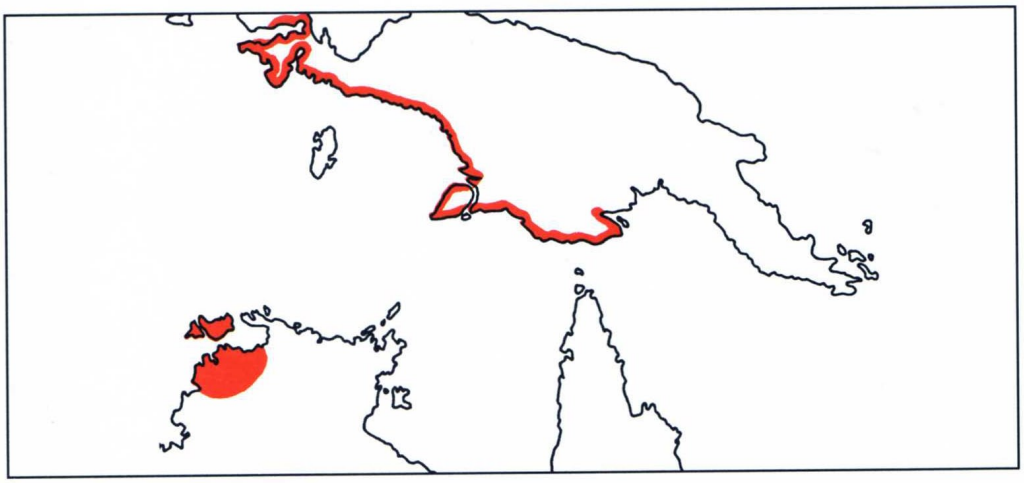
Pseudomugil gertrudae

takes about 10-12 days at 27° C. The newly hatched fry are 2.8-4.0 in length. They can be fed infusoria mixtures, vinegar eels, green water, and fine dust foods. After a week or two they will accept baby brine shrimp, microworms, ground flake food, and occasional green water. Maturation occurs very rapidly, in about three months, when the young fish are about 2 cm in length.

Distribution and Natural Habitat: It is widely distributed in northern Australia and southern New Guinea, but the Australian population is fragmented and highly localised. At least five Australian populations are recognised: 1) northern Cape York Peninsula, including the Jardine River and tributaries; 2) Murray Swamps near Tully, Queensland; 3) Finniss River system near Darwin; 4) Melville Island, a large island to the north of Darwin; 5) eastern Arnhem Land, Northern Territory, including Groote Eylandt. In New Guinea it has been mainly collected from the Pahoturi, lower Fly, and Bensbach rivers of south-western Papua New Guinea, but no doubt ranges westward into southern Irian Jaya. It also occurs at the Aru Islands. Preferred habitats include small creeks in open, sand-soil country, swamps and marshes, well-shaded rainforest streams, lily lagoons, and backwaters and overflows next to larger rivers. It is frequently found in Pandanus-lined creeks with muddy bottoms. Aggregations are commonly encountered in areas with abundant vegetation and submerged log debris. The water is often clear, but may be turbid or green with suspended algae. Other rainbows, including *Iriatherina werneri, Melanotaenia maccullochi, M. nigrans, M. splendida* (*splendida, inornata,* and *rubrostriatus* subspecies), *M. trifasciata,* and *M. goldiei,* are sometimes found in the same streams.

Habitat of *Pseudomugil gertrudae*, Jardine River, Cape York Peninsula

Status: The species was first captured by Dutch collectors in the early 1900's at the Aru Islands, which lies 120 kilometres directly south of the narrow isthmus connecting the Voglekop Peninsula and the remainder of Irian Jaya. It has been popular in the Australian hobby for many years, but is a relatively recent arrival on the international scene. The fish first arrived in Germany in about 1982 and has since made an appearance in North America. It appears to be abundant throughout most of its geographic range, but the distribution in Australia is very scattered. The southernmost population, inhabiting the Murray Swamps in Queensland, is probably a remnant of a former population that was widely distributed on the coastal plain extending northwards to Cairns. Land clearing for agricultural purposes (most notably sugar cane) has no doubt had a negative impact on the habitat. It is therefore important to preserve the present swamp environment, which extends for only a few kilometres. Otherwise this population will be lost.



Inconspicuous Blue-eye

Pseudomugil inconspicuus

ROBERT, 1978

General features: A marine and estuarine species from northern Australia and southern New Guinea, growing to about 3-4 cm. The colour is mainly semi-transparent. The fins, especially the caudal, are sometimes pale yellow.

Aquarium care: There is no available information. This is a marine estuarine species and therefore must be maintained in partial or pure sea water. It is a very delicate fish that is susceptible to shock from handling and transport.

Breeding: No information.

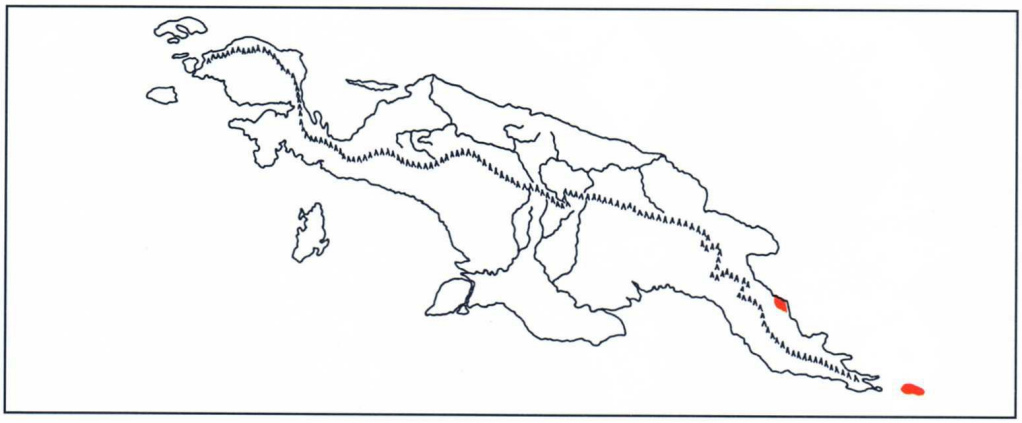
Distribution and Natural Habitat: It is presently known from coastal mangroves in a few widely scattered localities including the Darwin area in Australia, mouth of the Fly River, and Bristow Island near Daru in Papua New Guinea, and creeks drain-

Pseudomugil inconspicuus

Habitat of *Pseudomugil inconspicuus*, Bintuni Bay, Irian Jaya

ing into the northern side of Bintuni Bay, Irian Jaya. However, mangrove habitats remain poorly collected and it is probably widespread throughout northern Australia and southern New Guinea. It forms large aggregations in brackish tidal creeks lined by mangrove trees. The water is frequently very turbid.

Status: It was first collected in December 1975 near the mouth of the Fly River by American ichthyologist Tyson ROBERTS. The species is very small and relatively colourless, therefore it has not attracted the attention of hobbyists. It is still unknown in the hobby. It is extremely abundant in the few places that it has been collected.



Cape Blue-eye

Pseudomugil majusculus

IVANTSOFF & ALLEN, 1984

General features: A stream-dwelling Blue-eye from eastern Papua New Guinea, growing to about 5 cm. The colour is mainly pale yellowish with fine, dusky scale outlines. There is a horizontal row of about 10 vertically elongated, white spots along the middle of the side. The lower edge of the breast is yellow and there are white margins on the anal and second dorsal fins.

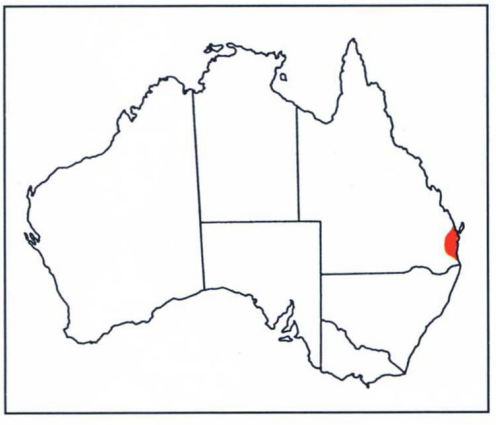
Aquarium care: It thrives in captivity. The recommended maintenance is similar to that of *P. signifer*.

Breeding: Similar to *P. signifer* (see below), which is a close relative.

Distribution and Natural Habitat: Previously known only from a single specimen collected in saltwater from mangroves at Cape Ward Hunt, approximately 190 kilometres north-east of Port Moresby. It was recently collected at Araeda Village on Tagula Island in the Louisade Archipelago, off the eastern tip of mainland Papua New Guinea. It was common in pure fresh water in a small creek, only 200-400 m from the sea. The 2-metre wide creek is well shaded by coconut trees and has a sand-gravel bottom. It flows right next to the village and is used for bathing and washing clothes.

Status: It was first collected in June 1979 by American ichthyologist Bruce COLLETTE. It was not seen again until June 1993 when Ernst Frei of Cairns, Queensland collected specimens at Tagula Island. The species is unknown in the aquarium hobby.

Pseudomugil majusculus



Honey Blue-eye

Pseudomugil mellis

ALLEN & IVANTSOFF, 1982

General features: A stream and pond-dwelling Blue-eye from south-eastern Queensland, growing to about 2.8 cm. The colour is similar to pale honey with bronzy reflections. Mature males have white margins and bold black submarginal bands on the dorsal, anal, and caudal fins. The first dorsal fin of males may form a short filament.

Aquarium care: An excellent aquarium fish. Several can be maintained in a tank of only 25-30 litres. Although this fish lives in very soft, acidic water in nature, it will adapt to alkaline pH in captivity. The recommended range is 6.5-7.5. The natural temperature range is about 23-30° C. It will accept a wide variety of live, frozen, and dry foods.

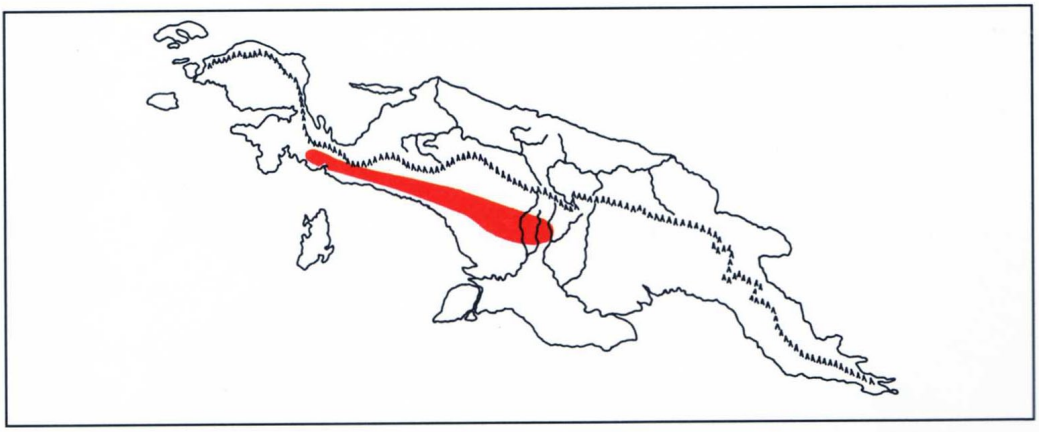
Breeding: Pairs or groups can be set up in a small tank that is supplied with either Java moss or a floating mop (or floating plants). Spawning occurs daily, usually in the afternoon, with each female depositing about 2-10 eggs per day. Mops or plants with eggs attached should be transferred to a hatching container with the same water quality as the spawning tank. The incubation period is about 8-9 days at 28-30° C. The babies will eat microscopic infusoria organisms initially, and after about one week are large enough for baby brine shrimp, microworms, and powdered dry food. They become sexually mature after about five months.

Distribution and Natural Habitat: Occurs only in a very small region of south-eastern Queensland, between Brisbane and Fraser Island. The habitat consists of slow-flowing, tea-stained creeks and dune lakes in sand-soil country (locally known as Wallum), near the coast. The pH ranges from 4.4 to about 6.0. The fish are found along grassy banks, often among reeds or water lilies. It is sometimes found living with *Rhadinocentrus ornatus* and *Melanotaenia duboulayi.*

Pseudomugil mellis

Status: The species has been known in the Australian hobby for several decades, but was formerly considered to be just a variety of *P. signifer*. Collections by H. MIDGLEY and the author near Noosa, Queensland in 1981 were instrumental in the recognition of *P. mellis* as a distinct species one year later. There is great concern about the survival of this species. Its numbers seem to be declining at a rapid rate. Housing developments and land clearing have negatively impacted the very limited environment. However, it is locally abundant in at least two areas, the Noosa River (about 130 kilometres north of Brisbane) and Lake Wabby on Fraser Island. Unfortunately, the latter population is threatened by encroaching sand drifts.

Habitat of *Pseudomugil mellis*, Tibrogargon Creek, Southeast Queensland



New Guinea Blue-eye

Pseudomugil novaeguineae

WEBER, 1908

General features: A stream-dwelling Blue-eye from southern-central New Guinea, growing to about 4-4.5 cm. The colour is mainly semi-transparent with dark scale outlines and a narrow, brown mid-lateral stripe. Characteristic fin markings of adult males include a red first dorsal spine, red outer margin on the first dorsal fin, blackish anterior edge on the anal fin, black streaks on the upper and lower edge of the caudal fin, and a white or yellow margin on the second dorsal, anal, and lower lobe of the caudal fin. The latter feature is interchangeable in the same individual. The yellow colour can change to white or vice versa almost instantaneously.

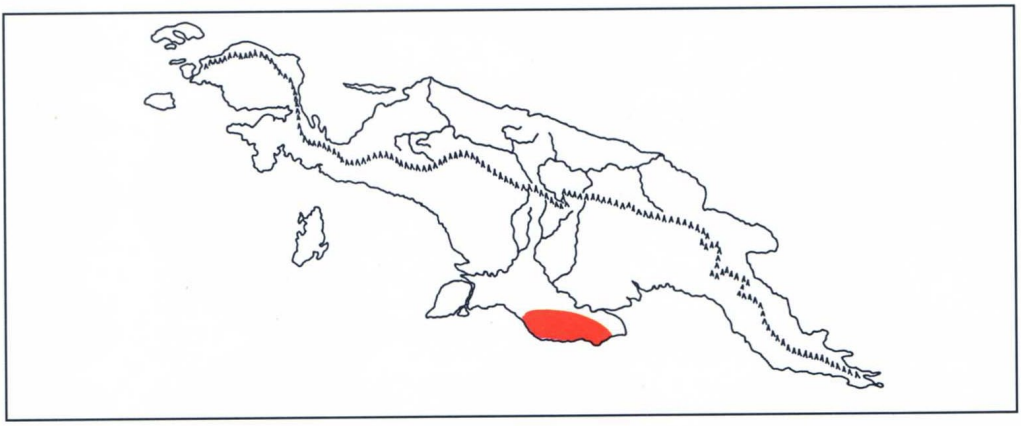
Aquarium care: There is very little information. According to an article in *Regenbogenfisch* (published by the IRG in Germany) it is easy to keep as long as regular water changes are provided.

Breeding: The article in *Regenbogenfisch* states that it is one of the easier Blue-eyes to breed. It will spawn in either mops or plants such as Java moss. Care and feeding of the fry is similar to other Blue-eyes.

Distribution and Natural Habitat: The species is widely distributed in central-southern New Guinea between the Fly River, Papua New Guinea and Etna Bay, Irian Jaya. It is also known from the Aru Islands. In the Fly River system it has been collected at distances between about 835-930 kilometres upstream from the sea. The habitat is in flat rainforest terrain, at elevations below about 100 m. The clear, shallow streams are well-shaded, but have occasional open patches exposed to sunlight. A temperature of 24.5° C and pH of 7.8 were recorded at one collection site in a tributary of the Ok Smak River, about 35 kilometres north of Kiunga on the Tabubil Road. *Kiunga ballochi* sometimes occurs in the same streams.

Status: It was first collected from a tributary of the Lorentz River in September 1907 by H. A. LORENTZ during the Dutch Scientific Expedition to New Guinea. Specimens from an unknown source were imported to Germany in about 1976 and further shipments were received there in 1989. Therefore the fish has been in the European hobby for many years, but has not achieved much popularity. It appears to be abundant in the natural habitat, but most areas where it occurs are virtually inaccessible.

Pseudomugil novaeguineae

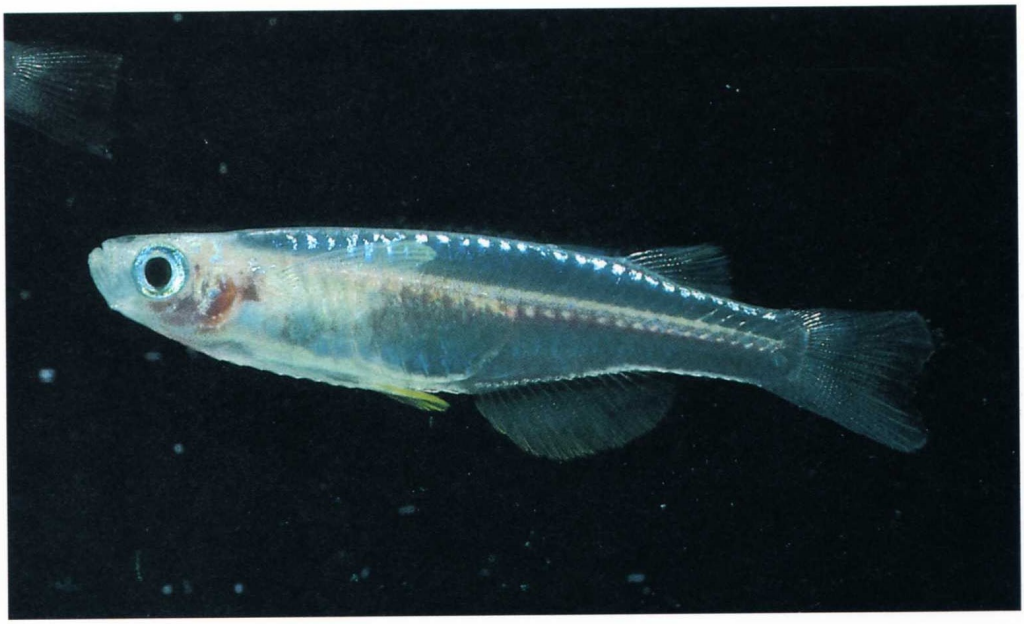


Swamp Blue-eye

Pseudomugil paludicola

ALLEN & MOORE, 1981

General features: A stream and swamp-dwelling Blue-eye from southern New Guinea, growing to about 3.2 cm. The body is semi-transparent, nearly colourless. The fins are mainly clear, except the pelvics are pale yellow. Mature females have a pale yellow colouration on the anterior part of the anal fin and on the caudal-fin base. The outer edge of the second dorsal fin of adult males is yellow. Fish from south-western Papua New Guinea usually have a tiny black spot at the base of the last ray of the anal and second dorsal fins, but these markings are absent in the population from the Vogelkop Peninsula. Males are noticeably more slender than females.



Pseudomugil paludicola

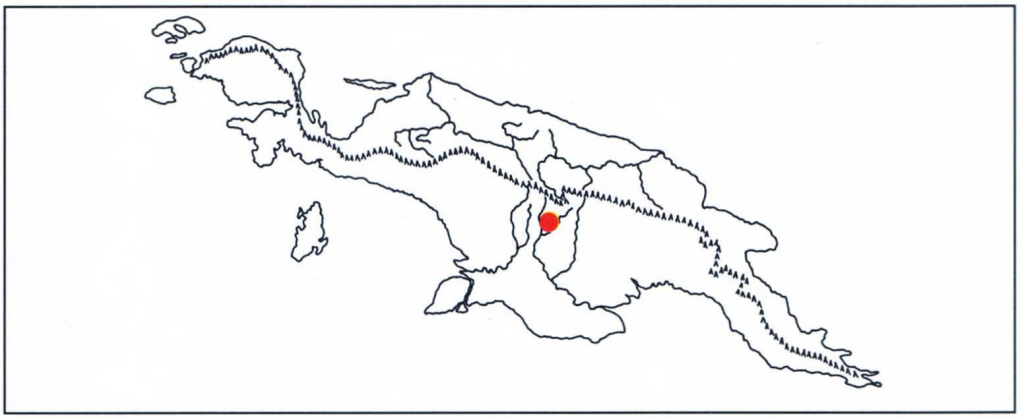
Aquarium care: Several fish were maintained by the author in an 80-litre tank with other *Pseudomugil*, *Iriatherina*, and juvenile *Melanotaenia*. Unfortunately I lacked experience at this stage in keeping *Pseudomugil* and eventually lost the entire stock. I neglected to offer live foods, which is probably critical for this species, although it readily accepted finely pulverised flakes.

Breeding: There is no information, but probably similar to other Blue-eyes such as *P. gertrudae*.

Distribution and Natural Habitat: Specimens have been collected from coastal swamp lands of south-western Papua New Guinea including tributaries of the Binaturi, Pahoturi, and Morehead rivers. It also occurs in streams near Sorong at the western extremity of the Vogelkop Peninsula. The habitat consists of coastal rainforests. I have collected it from clear, slow-flowing creeks and also from an isolated stagnant pool. The latter habitat was near Tureture Village in south-west Papua New Guinea. I visited the area in late September, near the end of a long drought. Most small streams were dry and standing fresh water was very scarce. I hired several young boys to locate water and after much searching they lead me to a small stagnant pool, deep in the jungle, about 5 kilometres from the coast. This was the last remaining water of a tiny tributary of the Binaturi River. The pool measured 4 x 1.5 m, with a maximum depth of 0.6 m. It seemed a highly unlikely place for fishes, but a single drag of the seine revealed hundreds of *P. paludicola*, several gudgeons *(Oxyeleotris)*, and a few *P. gertrudae* and *Melanotaenia splendida rubrostriata*. Temperature and pH readings in this pool were 26.8° C and 7.6.

Status: The species was first collected from a tributary of the Pahoturi River, Papua New Guinea by Raymond MOORE, a biologist employed by the PNG Fisheries Department, in February 1973. The first aquarium specimens were obtained in 1979 (see above section for details). These fish were subsequently lost and the fish has not been reintroduced to the hobby. The species is currently known from two widely separated areas in New Guinea, but further collecting will probably indicate a more or less continuous distribution. It appears to be abundant in the natural habitat.

Habitat of *Pseudomugil paludicola*, Binaturi River, Papua New Guinea



Paska's Blue-eye

Pseudomugil paskai

ALLEN & IVANTSOFF, 1986

General features: A stream-dwelling Blue-eye from central-southern New Guinea, growing to about 3.5 cm. The body is semi-transparent to bluish with narrow, dark scale outlines on the back, which may assume a neon yellow hue. The dorsal, anal, and caudal fins are mainly clear with numerous small black spots. The middle rays of the first dorsal fin and anterior rays of the pelvic fins are very elongated in adult males. The overall appearance is very similar to *P. gertrudae*, but the male of that species has a shorter filament on the first dorsal and pelvic fins, and over twice as many darks spots on these same fins. There is also a difference in the shapes of the male's anal and second dorsal fins. These fins are pointed posteriorly in *P. paskai* and rounded in *P. gertrudae.*

Aquarium care: Identical to *P. gertrudae.*

Breeding: Identical to *P. gertrudae.*

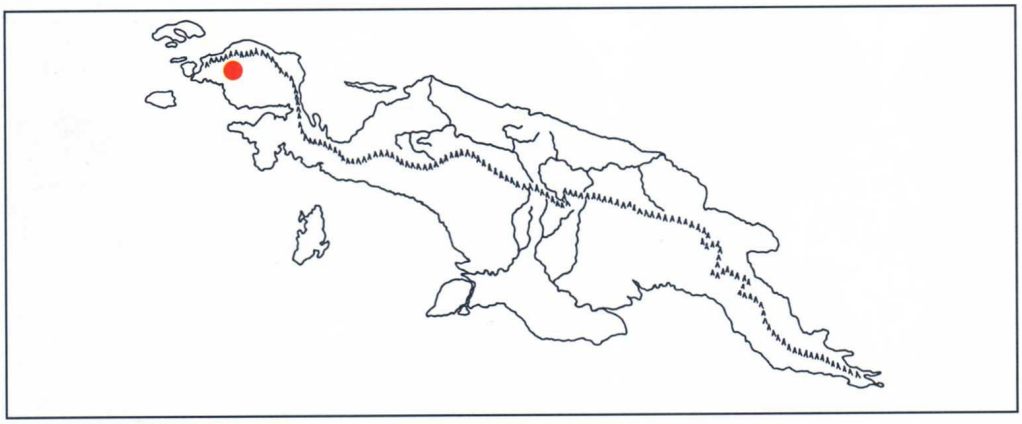
Distribution and Natural Habitat: It is currently known from a few small creeks in the upper Fly River system around the town of Kiunga, Papua New Guinea. The area is about 840 kilometres upstream from the sea and lies at an elevation of 120 m. The terrain consists of low hills covered

Pseudomugil paskai

with rainforest. Streams are slow-flowing and either turbid or tea-coloured. Aquatic vegetation is generally abundant. The pH and temperature ranges were 6.1-6.5 and 25-26° C. It was found in the same streams with *Melanotaenia sexlineata.*

Status: The species was first discovered by David BALLOCH, a biologist employed by the Ok Tedi Mining Company, and the author in 1983. A few live fish were collected at the same time and shipped to Australia. Barry CROCKFORD and a few other Melbourne aquarists successfully bred it, but the fish has never become well established in the hobby. Additional surveys are required to determine the geographic range and general abundance. The only specimens collected to date were obtained at creek crossings along the Tabubil Road, about 10-15 kilometres north of Kiunga. It was common in two of the creeks that were sampled. This area is only 35 kilometres east of Irian Jaya. Future surveys will probably result in a substantial westward extension of the range. Additional surveys are required to determine the geographic range and general abundance. The only specimens collected to date were obtained at creek crossings along the Tabubil Road, about 10-15 kilometres north of Kiunga. It was common in two of the creeks that were sampled. This area is only 35 kilometres east of Irian Jaya. Future surveys will probably result in a westward extension of the range, well over the border.

Habitat of *Pseudomugil paskai*, near Ningeru, Papua New Guinea



Vogelkop Blue-eye

Pseudomugil reticulatus

ALLEN & IVANTSOFF, 1986

General features: A stream-dwelling Blue-eye from western Irian Jaya, growing to at least 3.5 cm. The colour is overall pale tan with narrow dark scale margins. The fins and ventral part of the breast are yellow.

Aquarium care: There is no available information.

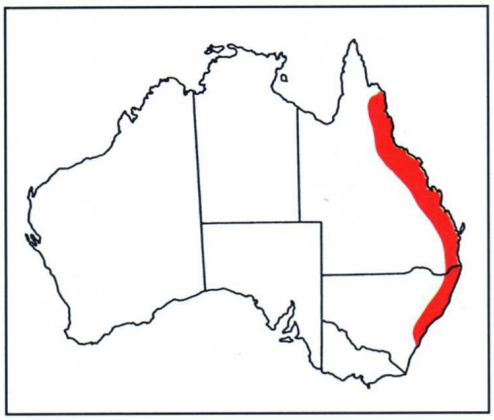
Pseudomugil reticulatus

Breeding: No information, but probably similar to other Blue-eyes such as *P. signifer*.

Distribution and Natural Habitat: It is known from a single specimen collected in a well-vegetated, rainforest stream, about 2 kilometres east of Ayamaru Lake in the centre of the Vogelkop Peninsula, Irian Jaya. This locality is situated at the headwaters of the Ayamaru River, which flows into the Kais, a southerly flowing river. The collecting site lies at an elevation of approximately 100 m above sea level, close to the hills which surround the Ayamaru Basin. Numerous specimens of *Melanotaenia boesemani* were captured with a seine net from this small creek. A temperature of 26° C and pH of 7.5 were recorded at the site.

Status: The species is still unknown in the aquarium hobby. Further collecting, particularly in nearby Lake Ayamaru, is required to determine the distributional limits and precise habitat. Only a single specimen was captured in spite of intensive efforts with a seine net for 45 minutes. It is possible that lakes, rather than streams are the primary habitat.

Habitat of *Pseudomugil reticulatus*, near Lake Ayamaru, Irian Jaya



Pacific Blue-eye

Pseudomugil signifer

KNER, 1865

General features: A stream and estuarine-dwelling Blue-eye from eastern Australia, growing to about 6.2 cm (but considerably smaller over much of its range). The colour ranges from yellowish tan to silvery blue-grey with fine, dark scale outlines on the upper back. There is often a mid-lateral row of 10-12 vertically-elongated white spots. The dorsal, anal, and caudal fins are clear to yellow with white margins. Colours, particularly of the male are greatly intensified during courtship and spawning. During this time the male displays a black band on the upper edge of the pectoral fin. There may also be a white band just above the black one. *P. signifer* is extremely variable, especially with regards to fin proportions and general colouration. At least 15 geographical varieties have been recognised, but detailed studies reveal there is only one species involved. One of the most distinctive varieties is from the Ross River in Townsville. Males have incredibly exaggerated dorsal and anal fins. The first dorsal is long and filamentous, reaching all the way to the tail when it is laid back.

Pseudomugil signifer

Habitat of *Pseudomugil signifer*, Harvey Creek at Cairus, Queensland

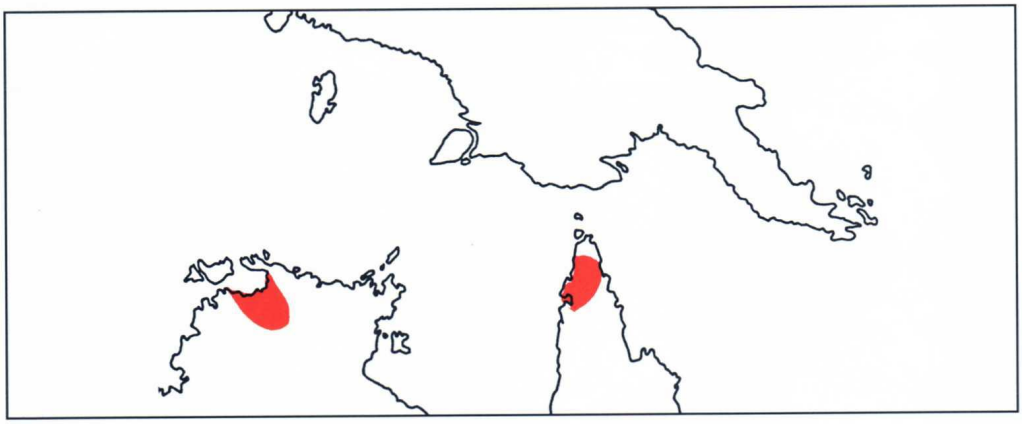
Aquarium care: A very active fish that is well suited for life in captivity. It should be kept separately or in a community tank with other peaceful species. The recommended minimum tank size is 30 litres. Optimum temperature and pH ranges are 20-27° C and 7.0-7.8. It seems to do best if a small amount (0.5 grams per litre) of salt is added to the water. Most standard foods, including live mosquito larvae, *Tubifex*, *Daphnia*, and *Artemia*, are accepted.

Breeding: Mature fish that are conditioned with regular offerings of live food will spawn readily. Group spawning with a ratio of 2-3 females per male is recommended. It is best to provide ample shelter in the form of plants and rocks. Males may become very aggressive during courtship and will attack disinterested females. Eggs are deposited daily in Java moss, on the roots of floating plants, or on floating mops. Each female releases up to 10-12 eggs per day. Most eggs are laid within about 10 cm of the bottom, therefore longer mops can be used or the water level can be lowered. The eggs are unusually large for such a small fish, measuring about 1.4-1.8 mm in diameter. They should be removed to a separate hatching container to prevent the parents from eating them. The incubation period is relatively long, 14-17 days at 27° C or 18-21 days at 22-24° C. Newly hatched fry are 5.5-6.0 mm long. The babies swim near the surface. They feed voraciously on infusoria, newly hatched brine shrimp, and powdered dry food. A length of about 2 cm is reached after three months and they become sexually mature about three months later.

Distribution and Natural Habitat: Widely distributed along the eastern coast of Australia from the vicinity of Cooktown, Cape York Peninsula (15° 28'S) southwards to Ulladulla, New South Wales (35° 21'S). The habitat is extremely variable ranging from pure fresh water to fully marine. The coastal habitat generally consists of tidal

mangrove creeks or mangrove shores along the coast and offshore islands (for example the Low Islets and Lizard Island off far northern Queensland). It is frequently present in clear, forest streams, but usually within about 15-20 kilometres of the sea. Water temperature is variable, 15° to 28° C, with the lower end of the scale applicable during winter over the southern part of the range. The pH also fluctuates widely according to habitat conditions, from 5.5 to 7.8. Perhaps the most scenic habitat is located between Innisfail and Cairns in North Queensland. The nicest creeks I've ever had the pleasure of swimming in are located here. *Pseudomugil signifer* and other fishes are easily viewed with mask and snorkel. A series of crystal clear, rocky creeks cascade through dense rainforest before spilling out onto the coastal plain. The streams are shared with *Cairnsichthys rhombosomoides*, *M. macculochi*, and *M. splendida splendida*. Normally this species does not live in the same streams with other *Pseudomugil*, but it occurs with *P. mellis* in Lake Wabby on Fraser Island, southern Queensland.

Status: First collected in the 1860's near Sydney. It has been around the Australian hobby for decades, but since the formation of ANGFA there has been renewed interest in keeping this fish. It has been available in Europe since about 1974 and was introduced to the American hobby in the mid-80's. The species is still abundant in the wild, but has no doubt suffered from habitat destruction in both metropolitan and agricultural areas.



Delicate Blue-eye

Pseudomugil tenellus

TAYLOR, 1964

General features: A stream-dwelling Blue-eye from southern New Guinea and northern Australia, growing to about 3.5 cm. The colour is mainly semi-transparent to light blue-grey with network of fine, dark scale outlines on the upper half. There is a mid-lateral row of about 12 pearly spots and the fins are frequently yellowish.

Aquarium care: It is susceptible to handling shock, but once acclimatised in captivity, it is relatively easy to maintain. The recommended care is similar to that of other *Pseudomugil* (see accounts for *P. gertrudae* and *P. signifer*). Recommended temperature and pH ranges are 25-30° C and 6.0-7.2.

Breeding: Spawns readily in captivity, in either groups or pairs. A tank of at least 30 litres is suitable. It should be minimally equipped with 4 cm of gravel, moderate

aeration, and either floating plants or floating mops. A tank position that receives 30-60 minutes of early morning sunlight is ideal, but not vital. Eggs are deposited on the mops or roots of the floating plants daily and should be removed to a separate hatching container to prevent the parents from eating them. The eggs are 1.0-1.2 mm in diameter. Hatching occurs in only 4-6 days at 25-29° C. The newly hatched fry are 4.0-4.3 in length. Infusoria, Liquifry, green water, and finely powdered dry food are satisfactory for initial feedings. After 1-2 weeks they will accept micro-crustaceans such as *Calanus* and *Artemia* nauplii, microworms, and pulverised flake foods. The young grow to about 1.5-2.5 cm after three months. Sexual maturation occurs when they are about 2.0-2.5 cm long.

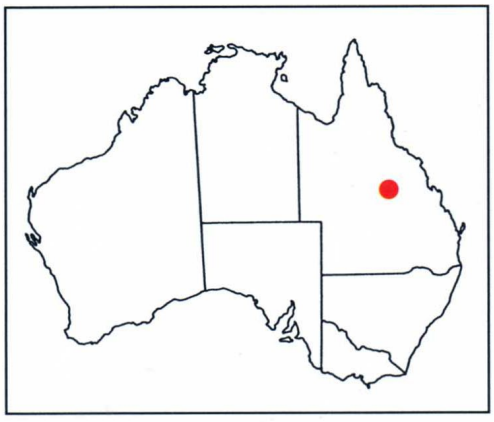
Distribution and Natural Habitat: Known in New Guinea only from the Bensbach River in the extreme south-western corner of Papua New Guinea. Most records are from Australia, where it occurs in the Northern Territory (Darwin eastward to the Blyth River) and Cape York Peninsula, Queensland (Edward River). It occurs in marshy ponds (billabongs) and quiet backwaters of rivers and creeks with mud, sand, or gravel bottoms. Usually there is an abundance of aquatic vegetation, including water lilies. Underwater visibility ranges from relatively clear to turbid (often caused by suspended algae). It is sometimes found in the same habitat with *Melanotaenia nigrans and M. splendida inornata.* At the Bensbach River I found it towards the end of the dry season in muddy side channels. Most of the channels were dry or nearly so, except occasionally there were small, circular pools of standing water. They were full of aquatic weed and the water was green from algal bloom. Each

Pseudomugil tenellus

pass with a one-person push seine yielded a catch of about 10-50 *P. tenellus* and also numerous glassfish (*Ambassis*).

Status: It was first collected in September 1948 by American ichthyologist R. R. MILLER from a tributary of the East Alligator River, Northern Territory. It has been in the Australian hobby for at least 10-15 years, but is generally kept only by a few native fish specialists. To my knowledge it has not been introduced to the hobby in Europe or North America. I doubt if it will ever enjoy a large following, mainly because of it's tiny size and relatively plain coloration. The species is known only from a few widely separated localities. More field surveys are required in order to evaluate the distribution and abundance.

Habitat of *Pseudomugil tenellus*, Bensback River, Southwest Papua New Guinea



Red-finned Blue-eye

Scaturiginichthys vermeilipinnis

IVANTSOFF, UNMACK, SAEED & CROWLEY, 1991

General features: A tiny, pond-dwelling fish, from western Queenland, Australia, growing to a length of about 2.5 cm. Adults are mainly semi-transparent with a silvery head and abdomen. The fins of males have a red margin.

Aquarium care: There are few reports of this species in captivity. Apparently it is not difficult to maintain, but should be kept in a separate aquarium. It is tolerant of a wide temperature range (20-32° C).

Breeding: This species will readily spawn in an aquarium with a relatively shallow (10-15 cm) depth. The sexes are usually apparent in fish between 12-15 mm in length. The red margins on the fins are diagnostic for males. Fish larger than about 15 mm are sexually mature. Good results have been produced with groups of

8-12 fish with a ratio of two females for every male. The most important factor in promoting spawning is a good supply of live food. Twice daily feedings of mosquito larvae is sufficient. The fish have no hesitation in depositing the eggs in floating mops. They scatter the eggs from the bottom to the top of the mop, usually in groups of 2-5. A group of eight fish were reported to lay up to 24 eggs (average 12) daily. The eggs will be eaten by the adults unless they are removed to a hatching tank. The 1.5 mm diameter eggs require 1-2 weeks before hatching. The fry will accept dust food, Liquifry, and vinegar eels, followed in 2-3 weeks by baby brine shrimp.

Distribution and Natural Habitat: This is a recently discovered species that occurs in small spring-fed pools. It is presently known only from six pools on Edgbaston Station at Armac, Queensland. The pools are puddle-sized, having a depth of only a few cm. There are grassy tussocks and weeds growing in the midst of the pools and along their margin. It is very dry, open country. The pools are exposed to full sunlight for most of the day and air temperatures may reach 40° C in summer. A water temperature of 38° C and pH of 8.0 were recorded in November. In April the water temperature at dusk varied from 23-25° C. The introduced Mosquitofish (*Gambusia holbrooki*) is also present in the pools.

Status: This species was first collected by Peter UNMACK in 1990. A small number are now established in captivity, mainly by ANGFA members in Queensland. It is still unknown in Europe and North America. The species was placed on the Australian list of endangered species in 1994 because of its extremely limited distribution, the negative impact of grazing sheep and cattle, and the invasion of its habitat by mosquitofish.

Scaturiginichthys vermeilipinnis

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Glossolepis incisus

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Pseudomugil cyanodorsalis

The Author

Gerald R. Allen was born in Los Angeles, California in 1942. His interest in Ichthyology came to life at an early stage when he started to keep tropical fish in an aquarium. Nevertheless, his devotion for diving began only at the age of 21 while he was studying at the University of Hawaii. That was the start of his interest for fish and has since, spent more than 3000 hours under water.

Dr. Allen graduated in 1971 as an Ocean Zoologist at the University of Hawaii. After this he spent one year on the research ship of his friend Dr. W. Starck. His interest in the classification and ecology of reef perch sprang to life during this journey.

Dr. Allen went to Australia in 1972 where he first worked in the Australian Museum in Sydney and, theirafter, in the fisheries department of the C.S.I.R.O. (Commonwealth Scientific and Industrial Research Organization). Since 1974 and up today Dr. Allen is director for the ichtyological department at the Western Australian Museum in Perth, Australia.

Dr. Allen has written 17 books and more than 160 scientific articles. He is an recognised authority on the systematics of coral fish in the Indo-Pacific-Region and freshwater fish from Australia - New Guinea. He is also a remarkable underwater photographer. Well over 2000 of his colour slides have been published. Numerous expeditions lead him regularly in the living area of rainbow fish, which he knows better than anybody.

The rugged outback of Australia and jungles of New Guinea are the kingdom of the colorful rainbowfish family. Only a few years ago these attractive fishes were almost unknown in this aquarium hobby, but now they are the latest sensation. This authoritative volume provides the most up-to-date information on their classification, aquarium care, and breeding methods.

All of the species, including the closely related blue-eyes are illustrated in brilliant color. Coverage is provided for over 70 species, including several new discoveries that are shown for the first time. The informative text is accompanied by precise distribution maps.

The book is written by the world's famoust rainbowfish expert, Dr. Gerald R. Allen. He provides an excellent account of each species with rare glimpses of how the fishes behave in their natural habitant. Personal anecdotes from his many years of fieldwork in Australia and New Guinea convey a very special feeling for the "realm of the rainbow".

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